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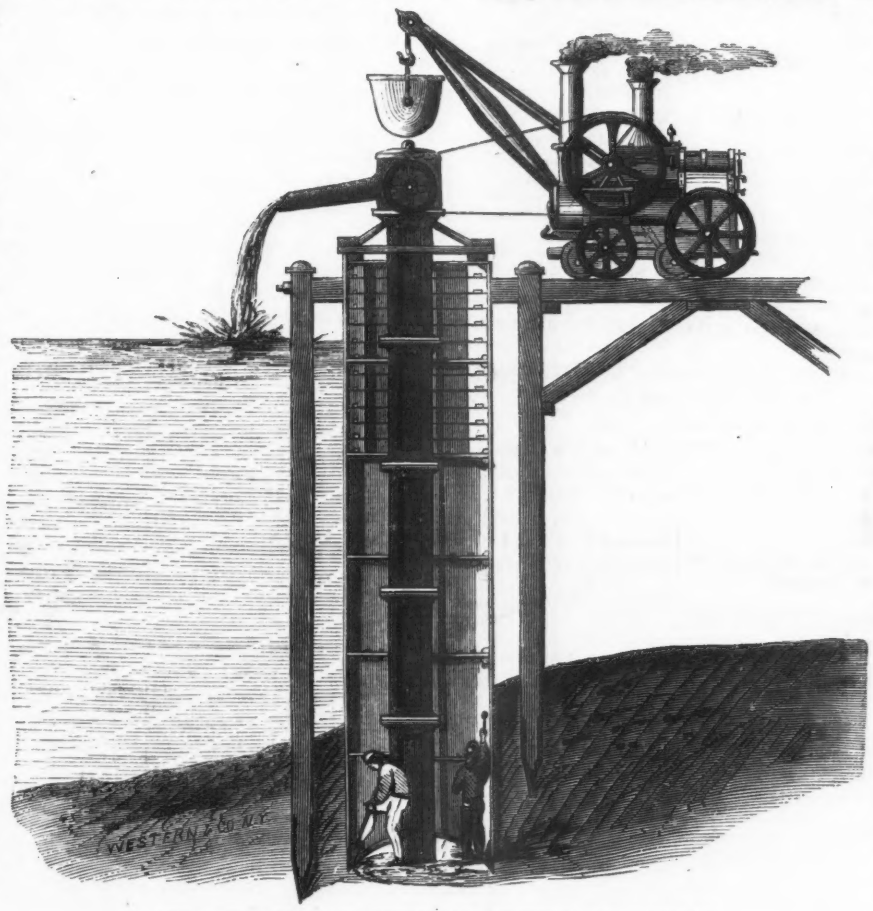
Iron Coffer-Dams.

A VAST extent of quay wall, river, and sea embankment will have to be constructed throughout the States, there is so much existing work of the above class which may be termed *temporary*, and which will inevitably have to be substituted for that of a more substantial and enduring character. The quay walls of New-York City, with their clumsy piers and rickety spiles, will soon prove their deficiency, apart from their being an outstanding disgrace, when the importance of their situation is considered. We must look forward to reconstructions of a more enduring character, now that the age of temporary construction and precipitate rush is over. It is a subject worthy of remark that, perhaps, of all classes of construction, that of embanking or reclaiming is more subject to precedent than any other.

Perhaps this may be accounted for by the antiquity of such work, and the immense value of matured experience. Not that we should ruthlessly disregard old forms, but that we should without hesitation replace them by new ones, if economy of cost, material, and construction should so warrant. The ordinary mode of construction adopted in the formation of river fronts, embankment walls, etc., where the foreshore is not rocky, and the depth of water does not exceed some thirty feet, a timber puddle-dam is generally allowed to be the least costly and most efficient mode of reclamation. Timber, particularly in this country, is generally near at hand and well adapted for sheet-piling; clay too for puddling can generally be readily obtained, leaving nothing but tie-bolts, not screws, shoes for piles, and the necessary machinery for dressing the timber, etc., to be furnished.

This method is generally effective in ordinary cases, but where the nature of the construction (be it embankment wall or bridge pier foundation) is required to be of an especially substantial character, and there are facilities for the transportation of material, we would suggest the following method as economical and efficacious. The plan of coffer-dam we are about to describe is a modification of the *caisson* principle, now of such universal application. There are various methods of sinking, etc., *caissons* for foundations; there is the Potts principle of exhaustion, also that of atmospheric compression, by dredging and sinking by weights and hydraulic pressure. The exhaustion system of sinking *caissons* has been of very limited application, and we will not further notice it. That of atmospheric compression we have personally applied to the sinking of *caissons*, and report adversely on its practice. The plan we propose discussing is one in which dredging and pumping is applied. Let us take the case of a heavy river or sea embankment wall to be constructed, and the following plan, we are convinced, in most cases, will prove more economical than any other established system.

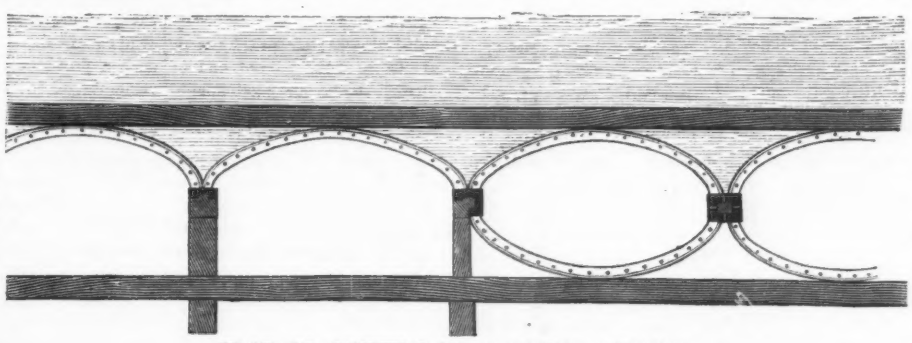
The term coffer-dam rightly applies to a dam enclosing work, as the pier of a bridge, etc., as in a coffer, but the term has become of general application to all dams reclaiming the foreshore from water, for the erection of structures, etc. Two lines of piles are driven at intervals of about 12 feet in a parallel row of about 6 feet wide, their heads being above the level of highest tides; walings are then bolted on, and timber-ties or transoms at regular intervals; the piles need only be driven a few feet, provided the soil be argillaceous or at all compact, this preliminary work being simply to serve as a guide for the reception of wrought-iron *caissons* to be sunk; other piling is driven at the back to support a temporary staying for engines and workmen. In very deep water, barges or dummies would have to be employed. To any point that it is desired that the work of the dam should commence, the *caissons* are floated up in barges. The *caissons* are formed of sectional wrought-iron elliptical cylinders about 12 feet long by 7 feet, and 4 feet 6 deep, of ⅜ boiler-plate riveted. Each cylinder is made in halves, vertically bolted together on two cast or wrought iron grooved pieces; they are also provided with inside flanges punched out for the reception of bolts, so that one cylinder can be bolted with facility to another, forming a tube of any length, which serves the purpose of a *caisson*. When one tube is placed endways with another, the grooves at the ends of each meeting forms a square drift, down which a key of timber is driven, serving as a guide pile, and also preserving the points of contact from leaking. The cylinders, either in halves or bolted together, are floated to the intended site of the work on barges, or otherwise, and if the water is, say, 18 feet deep, four cylinders would have to be bolted together. In such a case, a traveller would have to be provided overhead; but we have seen these *caissons* sunk in 25 feet of water, with a simple jib-crane, as in the cut, a driver being employed to adjust one cylinder upon another: sinking two columns of *caissons* together assists this. But such submarine work is costly, while a traveller can be used to perform all the hoisting work for the dam and the masonry, etc. The first cylinders sunk being the bottom one of the *caisson*, are pointed with a knife-edge, strengthened with inside gussets, at a height of about 9 inches from the bottom edge, the object being the more readily to pierce through the soil. The joints are made sufficiently good by strips of felt and Russian tallow. Caulking can be afterward applied to leaky parts. Even when successive cylinders have been bolted together to reach the surface of high tide, a perpendicular dredger or a spoon and bag-dredger is used to scoop out the soil from within the *caisson*—a dredger is preferred, with steel-tipped buckets, driven by an 8-horse engine. This operation generally occasions the lowering of the *caisson* a cylinder's length, in ballast or loose shingles, or still more if in running sand. Another cylinder is now added, and the dredging if possible is stopped, being continued in the contiguous cylinder, as this operation is an expensive one. A pump is then lowered. We recommend an English Murray's chain-pump, as much water is required to be raised, and in the roughest manner—stones, chips of timber, continually obstructing the pump *sump*. We have seen a piece of 6-inch quartering, over a foot in length, brought up by such a pump without injury; indeed, so strong are they, that they are with difficulty put out of order—they can be elongated with the utmost facility. The pump is driven by a portable 8-horse-power engine, and unless the cylinders are indifferently jointed together, or they are not sufficiently sunk, the pump generally gains head on the water sufficiently to allow for the descent of men to make the joints good, and commence excavating within the cylinder. If an accident should happen to the pump, or, by a slip in the soil, the water should rush in, escape is easily effected.



IRON COFFER-DAM—VERTICAL SECTION OF CAISSON.

Weights of five hundred-weight each are now ledged within the cylinder, as shown in section on the cut; these weights are of cast iron, easily hoisted in or out by a key fitted to the shackle of the hoist, but little encumbering the operations. Hydraulic presses have been used by employing a weight of rails or otherwise of many tons weight superposed over the *caissons* on a pile staging. The presses acting vertically downward on the top of the *caisson*, raise the weight (which is packed on a cradle) from off the staging, as a resistance, and bring it to bear upon the *caisson*.

As the pump draws, the water rushes in under the knife-edge of the bottom of the *caisson*, assisting the loosening of the soil, which is further aided by men with shovels clearing away stones and soil, etc., from beneath, until the *caisson* sinks through the more porous to more compact soil. This operation is shown in the cut; the *muck* is easily removed by a skip hoist. As the *caisson* descends, cylinders are affixed; contiguous *caissons* are sunk in line with or around the proposed work as desired—the keys before mentioned, or guides, with the walings, preserving their perpendicular position. When a length of these *caissons* is thus sunk concrete of a strength entirely depending upon local circumstances, is thrown in, together with coarse shingle (that which was removed, for example), until it has reached the level of the foreshore. Thus is obtained a solid wall foundation, forming a toe to the embankment, of great stability. Returns having been carried in-shore, the back halves of the *caissons*, above the bed, are unbolted and removed to carry on another section of the work. Struts or shorings, as seen on plan in the lower illustration, are affixed to what were the guide-piles or keys in the grooves, which now act as counterforts. A rigid shield or iron wall, formed of a series of elliptical arches, is thus left rigidly standing—its thinness permitting the work of excavation in the raising of the wall to be carried up close.



PLAN OF COFFER-DAM, SHOWING CAISSONS.

In twenty feet of water, the practice with timber coffer-dams, where the work to be put in behind them will occupy time to provide a six-foot width of puddled clay, thus occupying much valuable space, and tightness and compactness, the timber dam will not compare with the wrought-iron one. The iron dam compares favorably with the timber one, as in a known instance a timber and wrought-iron dam, as above described, were employed on river wall works in twenty feet of water, the iron dam setting a concrete foundation twenty feet below the bed. The timber dam cost approximately $125 per foot, and the iron cost but $102 per foot run. The cost in both these cases was necessarily high. The plan of wrought-iron dam described was extensively used in the Thames embankment works in London, but few modern works have been built with greater attention to durability. Indeed, we believe the plan was originated and perfected by one of the contractor's engineers, Mr. Lewis Moore, and a contractor, Mr. G. Furness, of those works, and has been already adopted elsewhere. We believe that much of the inconvenience attending timber puddle dams is overcome by this wrought-iron *caisson* system. All engineers are familiar with this difficulty in some soils (clay with a profusion of *septaria* or boulders, for example) of getting in a sound square line of strect piling; and if not sound, how much depends upon the clay? Then again, all engineers know too well the difficulty experienced with clay dams, of leakage at the tie-boits, cavernous spaces left by the subsidence of the clay, and how a little dishonest work will jeopardize the whole structure. Our remarks have applied chiefly to the construction of dams for substantial and heavy work.

The Roads of New-York Central Park.

BY WILLIAM H. GRANT, SUPERINTENDING ENGINEER.

PRELIMINARY to the construction of the Park roads, a thorough survey of the grounds was necessary, and a careful location of the roads as to lines of direction, curves, grades, etc. The proposed position of the roads, as indicated by a general outline plan, was the first point for consideration; as it was necessary to determine, by a careful investigation of the ground, how far it was practicable, with due economy, to conform to such a position. This involved the mapping out of the ground, levelling and making cross-sections and computations of the quantities of cuttings and fillings. More than usual care and labor were required in this work, in consequence of the general rugged character of the ground, the prevalence of rock, above the surface, and hidden at various depths below it, and the unusual breadth of ground occupied by the roads.

The problem was frequently complicated by other circumstances, such as the crossings of bridle-roads, traffic (or "transverse") roads and walks, which were to be passed by bridges, either over or under the proposed line of road.

Comparative lines and modifications were necessarily considered, surveyed, plotted out, and estimated. When this was done, and the best compromise practicable made in the selection of the position of the roads, it was next necessary, where surplus material resulted from the excavations in grading, to find a place where such material could be turned to account and utilized in some other portion of the general work of improvement. In like manner, where a deficiency of material resulted from the excavations to fill the depressions, the site had to be sought on adjacent grounds, whence such deficiency could be made up or "borrowed," and at the same time develop if possible, or at least not detract from, the natural features of the ground selected.

The desideratum was, of course, as in all cases of roads, railroads, canals, and similar earthworks, to equalize cuttings and fillings. This process was perfected by modifications and readjustments of the grades from time to time, as found practicable after the general location was made, and also by slightly swaying the line of the road laterally, one way or the other, along steep side-hill ground, so that the portions of earth and rock lying above the grades, including the necessary side-slopes, would, when excavated and removed, just fill up the intervening hollows lying below the grade-line.

Where there are no restrictions as to the acclivity of the grades of a road, and the shortness of curves to be adopted, or, as to the position laterally that the road is to occupy, this problem is greatly simplified and admits of a comparatively easy solution. But in the case of the Park roads, it had been decided, after a general study of the adaptation of the ground, to limit the maximum grades of the roads to one foot rise in a distance of twenty feet, and to make the curves large and sweeping, so as to admit of the easy turning of vehicles at brisk rates of driving, and of seeing a safe distance ahead; the position of the roads, laterally, was also restricted, in most cases, to quite a moderate breadth of ground. Hence it will be readily understood, especially by engineers, that a judicious location of the roads with reference to proper economical considerations, was no light task.

GRADING.

The location of a section of road having been made, the ground was staked out, and the depths of cuttings and fillings marked, etc., and the work of excavating, grading, and preparing the road-bed for the reception of the road material or superstructure, was then proceeded with. Care was tak n, in making the deeper fillings, to compact the materials so as to prevent subsequent settling and derangement of the work when the road was finished. All surface-soil, muck, and vegetable or perishable matter, were removed from the surface in advance of the filling; wet, spongy ground was also excavated a proper depth to make room for better material. If surplus stones were afforded by the excavations beyond what were wanted for the road materials (superstructure), or if the stones were of unsuitable quality for other work, they were deposited in such places and in such positions in the fillings, as were best calculated to facilitate the drainage and give firmness to the road-bed. When large stones and masses of blasted rock were used in the fillings, care was taken to fill the interstices between them with smaller stones and earth.

The filling was carried on in this way in horizontal layers, until it reached its full height, advantage being obtained, as far as practicable during the operation, of the travel of teams and carts over the successive layers, to aid in compacting the material. The filling was evenly shaped at the required height or "sub-grade," a crowning form being given to it transversely of the roadway, corresponding with the intended crown of the surface of the road when finished. The best material was selected from the excavations, for the last or surfacing layer, such as gravel, gravelly or sandy loam, or gravelly clay, as the case might be, and this, after the proper shaping, was firmly and uniformly rolled by heavy cast-iron rollers drawn by two horses. Any inequalities or depressions occurring during the rolling, were filled up with fresh material, and the surface kept true to the sub-grade line longitudinally, and to the curved or crowning form transversely. The excavations were sunk generally to the same sub-grade line to which the fillings were raised; if in earth that was not deemed suitable for the road-bed, they were sunk somewhat deeper, and the additional depth was refilled with better material, as before stated. In rock excavations, the rough, irregular depressions at the sub-grade depth of the road, that were caused by blasting, were filled with small stones and chips, in such a way as to keep the drainage free from the middle of the roadway to the side-drains, and, as far as practicable, outlets were given to all the deeper cavities of the rock, to prevent water from standing in them.

The road-bed was crowned, adjusted, and rolled after the drainage was perfected, in the same manner in the excavations as on the fillings.

Generally, before the completion of the surfacing process of the road-bed, the necessary trenches were dug for the "surface" and "sub-drainage" pipes, and for the water-pipes that were laid alongside the roads, the drains and pipes laid down and the trenches refilled.

DRAINAGE.

After a firm foundation has been secured to build upon, the next important step in good road-making is drainage. Without a firm foundation, no art can achieve a successful superstructure, and without thorough drainage, no superstructure, however well founded and otherwise skilfully built, will long resist the severe effects of our climate. Frost is a most destructive agent to roads and walks. It can only be resisted by depriving it of the means by which it acts—wet and moisture. Water retained in the soil, or in the materials composing a road, soon produces deteriorating effects. The foundation is liable to settle unequally, displacing and deranging the materials above, and the surface of the road will wear away more rapidly by attrition, when saturated, producing alternately mud and dust. When the water is acted upon by frost, it will loosen and heave up the best road, and undo in a short time all that the appliances of art, in the use, disposition and manipulation of the best materials, have accomplished. Therefore, it is held, that upon the thoroughness of the manner in which the drainage of a road is performed, and its successful operation, will depend the permanence of the work.

Road-drainage is of two kinds—sub-drainage or under-drainage, and surface-drainage. Sub-drainage applies to the disposal of water that finds its way to the road-bed below the road materials, and into the ground forming the road-bed and immediately adjacent.

Surface-drainage applies to the rain-fall and water from melting snows and other sources, received on the surface of the road and side slopes, and to the mode of conducting it away before it enters the ground or accumulates in too great a volume.

1. SUB-DRAINAGE—Where the roads were not laid fillings or "made ground," the nature of the materials was generally such as not to require special sub-drainage; where they were laid on, or very near the natural surface of the ground, and on excavated ground, which constituted the larger portion, sub-drainage was essential.

In rock excavations, the mode of drainage of the road-bed has been in part indicated. In both rock and earth excavations, side-trenches were excavated, following nearly the lines of the road-gutters, for the reception of drain-pipes for both sub-drainage and surface-drainage, and also for the water-distribution pipes of the park. The latter pipes occupy but one side of the road, branch pipes being laid from them where necessary across the road, to supply hydrants on the opposite side. In rock excavations, to save expense, the water-pipes, surface-drainage and sub-drainage pipes on one side of the road, were all laid in one trench, and on the opposite side of the road the sub-drainage and surface-drainage pipes were also laid in a single trench.

In earth excavations, and in crossing fillings or made ground, the water-pipes are laid in a separate trench from the other pipes. At intervals of about three hundred feet along the roads, "silt-basins" are constructed (as will be hereafter described) on each side of the road, into which the sub-drainage pipes discharge, and the water flowing out of the basins is conducted through a short branch pipe, into the larger surface-drainage pipes. The sub-drainage pipes, in consequence of their discharging at these short intervals into the silt-basins, are not required to be large, and are composed of common drain tiles of 1½ to 4 inches bore. They are laid at a depth of three to three and a half feet below the surface, with an inclination of, generally, not less than one foot in one hundred feet of distance. The manner of laying them is the same as that adopted in the general sub-drainage or agricultural drainage system of the Park, which is as follows: The separate pieces of pipe are carefully and truly placed on the bottom of the trench, with their ends in contact; a "collar"—which is a short section of a larger sized pipe—being slipped over the joint, or a "saddle"—which corresponds with about the half of a collar divided longitudinally—is laid over the joint to prevent dirt from entering or being drawn in by water. The collar is preferable to the saddle, as it is a more effectual safeguard against the joints of the pipe, or the pipe itself, being choked with earth. The drainage water gathering in the bottom of the trench finds its way freely, in all ordinary cases, through the slight annular space (the collar fitting easily but not too loosely) between the pipes and collar, and through the inclosed joint into the pipe. The roughness and inequalities of the ends of pipes, although in contact, afford sufficient openings for the water to percolate through, and the frequency of the joints (about twelve inches apart) gives room for the admission of water in no great length of pipe, equal to the capacity of the pipe to carry safely. The covering of the pipe with earth is done with care; a light layer of selected material, free from stones and lumps, is first packed around and over it so as to cause no derangement of joints, and the balance of the trench is then refilled and thoroughly rammed, to prevent, as far as possible, any future yielding or sinking away of the earth.

The sub-drainage pipes in the side trenches of the road, extend in this manner from one silt-basin to another, starting a few feet in advance on the down stream side of one basin, and extending to and entering the next one in the descending series. Lateral or branch drains are laid from these drains, running obliquely in the ascending direction, to the middle of the roadway, and are placed at greater or less distances apart, according to the circumstances of the ground. These lateral drains are composed of smaller tiles than the side drains; sometimes instead of tiles, cobble or small quarry stones are used, and in such cases a shallower trench is dug than for tiles, the trench being from fifteen to eighteen inches deep below the sub-grade of the road, and of a width about equal to the depth. The trench is filled with stone, or with stone and coarse gravel, to the surface, and a communication is made at the lower end of the drain with the side or main drain running parallel with the road, by a short piece of pipe, having one end fitted into the side drain, and the other end extending into and surrounded by the stone, or gravel. Drains of this kind are sometimes called "mitre drains." Sometimes, where more than ordinary precautions are necessary for draining the road-bed, the tiles for the lateral drains are covered with coarse gravel or rubble stones in place of earth, and the trench is partially or entirely filled with the same material. The main side-drains are also occasionally treated in the same manner.

This method of sub-drainage was applied more particularly, in the detail in which it is here described, to the wider roads of the Park that were earliest constructed, the widths being from forty to sixty feet. For the roads of less width, later constructed, the process was somewhat modified. The side-drains, by being brought closer together (by the less width of the roads), rendered, on most ground, the lateral or mitre-drains of the road-bed unnecessary. Considerable portions of the narrower roads (thirty-three feet wide) were laid on "made ground" that was composed largely of blasted rock and stone filling, and therefore needed no additional sub-drainage of any kind.

2. SURFACE-DRAINAGE.—The surface or superficial drainage of roads is quite different in character from the sub-drainage, but is not the less important. Its object is, in part, to relieve or assist the sub-drainage, by disposing of water that would otherwise, to more or less extent, filter into and saturate the ground; but mainly its purpose is to guard against the sudden gathering of water in large volume, and the gullying of the ground along the road, or sweeping away or abrading the road material. To illustrate the necessity of such a provision, it is only necessary to recur to some well-remembered instance—within the experience of most persons—of a country road, where the effects of showers of rain have been seen, in the deep and dangerous gullies formed by accumulations of water, following a long distance in the line of what was once, perhaps, intended for gutters, without any escape or outlet.

The first element to be considered, in a proposed system of surface drainage, is the amount of rain-fall to be provided for, and the next step is to devise the most practical and efficient means, with due regard to economy, by which to attain the desired result. The mean annual amount of rain-fall, including melted snow, as furnished by meteorological tables, is not a safe guide; the extremes only (that are not generally recorded) of rain-fall, in the shortest spaces of time, furnish such data as is necessary for the object. This, however, if accurately ascertained, can only be taken approximately, and must be very much modified by a variety of circumstances. It would not be practicable to give to any artificial system of drainage, such a capacity as would meet emergencies that arise at widely recurring and uncertain intervals of time, as the great expense of such a system would, in all probability, surpass the amount of injury that might be done through the inadequacy, at such a juncture, of a modified plan. We do not find, in the economy of nature, works of an hydraulic character upon so extended a scale as this. Rivers sometimes

overflow their appointed channels, and flood plains and valleys; and rivulets that course down mountain-slopes for years together, in capacious and well-worn beds, are occasionally swollen, in so unusual a manner, as to break over and abrade away their strong and rocky barriers.

Where Providence does not provide for extreme elemental contingencies, it would scarcely be wise for man to attempt to do so.

A practical mean has to be found somewhere between the occasional or ordinary, and the remote or contingent extremes of rain-fall, before settling upon the practical capacity of drainage-works. This point received a good deal of attention in connection with the roads and the general subject of the surface-drainage of the Park. All available information and examples were consulted, but no special rule could be deduced, past experience and practice having settled, at most, only general principles, leaving the formulæ applicable to any particular case or locality, to be worked out according to individual judgment and the peculiar attending circumstances. The nearest approach that has been made to definite rules and unanimity of opinion, is in the drainage of cities; but here even, differences exist that are not easily reconcilable. Besides, the circumstances are so different in the two cases, of city drainage, and open-land drainage, that a rule, however clearly established in the one case, would not safely apply in the other

The question was settled as regarded the Park roads, by deciding upon such a provision for the drainage as would safely dispose of an amount of surface-water equal to a rain-fall of two inches in depth in the space of one hour. It is rare that such an amount of rain falls in this part of the country. No recorded instances have been met with of rain to that extent in the vicinity of the city of New-York. The only instance that is known to be reliable occurred on a part of the Central Park grounds on the 13th day of July, 1859. The quantity of water that fell at that time, in the space of half an hour (within a fraction), was two inches, as ascertained by a rain-gauge that was kept by the engineer department. It occurred during a heavy thunder-shower, the violence of which lasted but little over the half hour, and which was evidently very local in extent. The amount of water was very unusual, being just double what it had previously been decided to provide for in the drainage system, and it would have been alarming, had it not been known to be unusual and exceptional.

The portion of the Park grounds upon which the most of the shower appeared to fall had not, at that time, been much broken up or disturbed by the progress of the various works of improvement, and but little damage was done by the water.

No similar rain-storm has occurred on the Park* since that time, nor has a quantity of rain since fallen, it is believed, at any one time, equal to two inches depth in one hour.*

Had the drainage-works of the Park been fully completed, together with the roads and other works of improvement when this storm occurred, it is not imagined that very material damage would have been done. Some injury would doubtless have been sustained by the roads, by the overflowing of gutters and washing off of the surface materials, and temporary ponds might have been formed in depressed portions of the grounds, but nothing more serious would have been likely to have occurred by a shower that was so limited in its range and duration.

Should such an amount of rain fall at a time when the grounds were covered with a considerable body of snow, and the grounds not frozen, the accumulation of water might so much surpass the capacity of the gutters and drains, as to cause the gullying of the roads and grounds. But the simultaneous occurrence of such contingencies, although possible, is not so probable as to cause very great apprehension, or to justify the construction of works on a scale that would be fully adapted to meet it.

The drainage system for the roads of the Park, adapted, as before stated, to a rain-fall of two inches in depth in one hour, is believed to possess about the maximum capacity that is reasonably practicable or desirable for such purposes under similar circumstances. It is on a somewhat larger scale than is generally adopted for city drainage, but if any doubts were remaining upon the subject, they would not be on the side of a reduction of the capacity.

[To be continued.]

The Straits of Dover Bridge.

REFERENCE was made in a late issue to the fact of M. Boutet having been granted an experimental ground for the exhibition, etc., of the models of his proposed bridge to span the Straits of Dover, by the Emperor of the French, who has since visited the Dépôt des Marbres to examine those models. M. Boutet carefully explained to His Majesty the various details connected with the construction. The Emperor, with a view to convince himself of the value of the system, stood upon one of the little models, and expressed himself astonished at the incredible rigidity which it possessed in every respect, and the relative lightness of a locomotive and tender constructed on the scale of the bridge. His Majesty then proceeded to examine the little bridge intended for the school at Vervins (Aisne), and walked over the foot-bridge, which is almost finished, and which is to unite the Senlis promenade with the railway, afterward turning his attention to the mode of making the cables and "tresses," questioning M. Boutet very closely and with much interest as to the facility of execution, and the great economy that will result from the application of the system to the construction of bridges in general. Before leaving, the Emperor went into the offices to see the large plans of the Channel Bridge, the details of which were carefully examined. His Majesty put several questions as to the dilatation and oxidation of the metal, as to the means of verifying the form of the bed of the sea, so as to facilitate the fixing of the piles, and getting them level in case the bed should be unexpectedly irregular — the questions displaying a thorough knowledge of the subject, and that he had studied the matter to its foundation. His Majesty warmly congratulated M. Boutet, and desired him to send his plans and pamphlet to him as soon as they were printed. M. Boutet availed himself of the opportunity to present Commander Porteu, of the Imperial Marine Artillery, and the promoter of a large bridge from St. Malo to St. Servan à Dinard, who, having visited Paris to consult M. Boutet on the subject, happened to be present at the moment of the Emperor's visit. Commander Porteu was very graciously received by His Majesty, who listened with great attention to his explanation of the advantages which will result from the construction of the bridge, which will be fully a kilometre in length, with but one support, at the Bizeux rock. M. Boutet showed the Emperor his plans for the said bridge, which is twenty metres in width, and is to carry a railway as well as a carriage-way and pavement for foot-passengers. His Majesty remarked that this would be a good application of the Boutet system, and that Commander Porteu might send him the memoir which he had prepared upon this project as soon as it was printed.

* The Croton Aqueduct Department report "an extraordinary rain-fall in the city of New-York, in October, 1866, of upward of four inches in about five hours."

Rocky Mountain and Salt Lake Scenery.

TO THE EDITOR—SIR: The scenery along the Union Pacific Railroad, east of the summit of the pass by which it crosses the Rocky Mountains, is by no means mountainous. The traveller would never suspect, unless he were told it, that he is climbing the height of the once forbidding barrier between the east and west. The landscape seen from the windows of a luxurious palace-car is indeed not devoid of beauty. The plains have a variety as well as grandeur of their own. But leaving Cheyenne to go to Denver, we are brought very soon into full view of the great snowy ranges, which accompany us thenceforward all the way. The view from Denver, comprising two hundred miles of the range, is unsurpassably grand and lovely; and a few days' journeying into the heart of the mountains, through the wild cañons of Clear Creek, over the central ridges into the famous "parks," reveal beauty and sublimity enough to satisfy the most *blasé* tourist.

It were puerile to call this region the Switzerland of America. Let no man die (who can help it) without seeing both. Yet, if comparisons are to be made, I can confidently say that Colorado, in its parks, possesses one of those displays of natural beauty for which America may challenge the world to find a superior. Niagara, the Mammoth Cave, the Parks of Colorado, Yosemite, the Cañon of the Colorado, in Arizona, and the Dalles of the Columbia, in Oregon, belong to what a learned friend of mine calls "the *uniquities* of the universe." Not quite so unapproachable, but still memorably picturesque and impressive, is the scenery of Echo and Weber cañons, in the Wasatch Mountains, through which passes the Pacific road. Last year, climbing slowly through these cañons in the stage, we met great trains of Mormon immigrants, weary with their long journey from distant lands, but eagerly looking forward for the first glimpse of their sacred city, of their New Jerusalem. It was a sad sight to me, and sadder yet would it have been had I witnessed their joy-when, a few miles further on, the long wagon-trains debouched into the broad, sloping plain, and the fair, embowered city of Salt Lake lay before the glad eyes of the deluded pilgrims. A great many women and young girls were in the wagons; and it was pitiful to see how joyously and unconsciously they entered that magical ring from which they could never escape, and within which woman is made to "know her place" as a household drudge. Anna Dickinson visited Salt Lake the other day; and I am glad of it. There is matter here for all the earnest thought and indignant eloquence which are, perhaps, now and then, just a little bit wasted, in political directions, by the champions of the rights of the sex.

But no thoughts of this kind intruded upon our minds as we glided by night, over the smooth rails, down through the narrow gorge of Echo, the sides of which gathered up the noise of our wheels, and threw it back to us in salutes of thunder as we passed. It was not such a deafening rattle as drives to madness the occupants of a Hudson River express-train, but a lower and more distant reverberation, as if we were shooting for miles across some sonorous bridge. Over us almost hung the red cliffs of conglomerate, carved fantastically by winter frosts and spring torrents, and cut down at times to the very level of the stream by deep side-cañons, now dry, but green with grass and shrub, bearing witness of musical days in the time of the thawing snows; and over all was the deepest and clearest of skies, and in that fathomless crystal depth, the floating, white, full moon.

From Echo Cañon, we turn sharply into the less precipitous but longer and, in some respects, more picturesque, winding gorge of Weber. Again and again we cross the rushing river, its beaded foam jewel-set in the moonshine. The moon keeps us company, just hanging over the edge of the mountains; but often we plunge under their shadowing crests into the darkness, and emerge again into silvery light. Take the best part of the Highlands of the Hudson, compress it to a narrow valley, and let a turbulent little river, instead of a wide and peaceful one, flow between the heights, and you will have some notion of the Weber Cañon as it appears by night—the luxurious foliage of the Eastern forests would be missed by day; but night turns shadows and bushes into stately trees. At the very end of the wild passage, the river makes a desperate leap through a chasm in the rocks, known as the Devil's Gate, whither the railway wisely declines to follow it, and finds its way by a less diabolic route into the Salt Lake basin. At the station of Deseret, and at the witching hour of midnight, I left the train, and betook myself to the Wells-Fargo stage for Salt Lake City. The distance is about forty miles, and we made it, behind six spirited horses, frequently changed on the road, in about four hours. For the greater part of the way, the road lies along the foot-hills—the mountains towering on our left, and on our right the peaceful, broad expanse of the Great Salt Lake, partly glowing in the moonlight, partly sheeted with mists, out of which, in soft, vague outline, rose the distant islands, and seemed to hover between heaven and sea. Through thrifty Mormon villages we sped, the dwellers all buried in sleep; and at last, as the dawn broke, we rattled into the broad streets of the City of the Saints. On either hand, in every street, streams of clear running water, and rows of flourishing trees, and in the midst the great New Tabernacle, and the foundations of the Temple that is to be, remind us of the vision of the New Jerusalem. Indeed, this resemblance has another foundation than that of intentional imitation on the part of the Mormons. Few countries in the world resemble Syria and Palestine in climate, contour, and general conditions more closely than does the central portion of this continent; and St. John's description of a beautiful city, imagined in Palestine, must needs be partially copied by those who would build one by the Salt Lake. The mountain stream, which, divided into many rills, and flowing through every street, irrigates and makes fruitful all the gardens and orchards of Salt Lake City, is literally the water of life to the inhabitants. But the parallel between this city of ignorant fanaticism and the New Jerusalem cannot be carried very far, whatever the Saints think.

On a plateau, elevated above the city, stands the former "Arsenal" of the Mormons, now a peaceful butcher-house; and not far away, several tents dot the hill. It is the head-quarters camp of Clarence King, the young but famous explorer, field-geologist, and mountain climber. He is directing now the great United States survey, geographical, geological, and topographical, of a belt of country enclosing the Pacific railroad, and therefore imperatively demanding, in the interest of the citizens, as well as the government, such an examination. Luckily, though all his parties were out, I found Mr. King in camp. A youthful face, which much exposure cannot darken to more than a blonde brown; light hair and beard; clear, keen, blue-gray eyes; a small, trim, well-proportioned and well, knit figure, and a manner of complete self-reliance, covered and smoothed of aggressiveness by cordial good-fellowship—that was Clarence King, as we lay together, on a pile of skins and blankets, and chatted scientific small-talk, and politics, and exchanged news, as travellers away from home always do, while the fair city lay spread at our feet, its white houses peeping through its bowers of green, and beyond it the snowy peaks of the Wasatch and Diamond ranges lifted themselves into the blue, and westward stretched the smooth lake. More than once came showers, as we sat; and my companion told how sudden and terrible were sometimes the storms upon the lake. Only a few days before one of his parties engaged in exploring the islands of Salt Lake was wrecked, and barely escaped with their lives and notes of survey. This body of water, though eighty miles in length, is very shallow, not exceeding, it is said, in any place where soundings have been taken, the depth of 100 feet. The waves that rise in such shallow waters are very violent, and to this universal fact is added in the present case the weight of the water, saturated as it is with salts. A blow from it strikes like a slung-shot or a sledge-hammer.

But there's an end to pleasant interviews, which is unfortunate; and to editorial correspondence, which is just the reverse. R.

July 3d, 1869.

Fires in Mines and the Means of Extinguishing Them.

BY R. P. ROTHWELL, ENGINEER.

FIRES in mines are scarcely less terrible calamities than fires at sea, and they do not need to be of frequent occurrence to render a knowledge of the means adopted to extinguish them a matter of the greatest importance to all holding the responsible position of mine superintendents, and, in fact, to all interested in mining adventures.

Taking account of the nature of the mineral, we are not surprised that fires should be much more frequent and dangerous in coal than in ore mines; they are, however, by no means confined to coal or lignite deposits, but may and do occur in all kinds of underground workings where timber is used. In the great majority of cases, fires originate, below as above ground, through carelessness or imprudence: a miner will leave his lighted candle or lamp in such a position that it can ignite a prop or other piece of timber. Such appears to have been the case in the recent disastrous fire in the Crown Point, Kentuck, and Yellow Jacket mines. The careless or imprudent hanging of a grate or fire-pot near the coal at the foot of our downcast shafts or slopes (where it is placed in winter to prevent the pumps and roads from being covered with ice) has been the cause of fires in several of our anthracite mines. Ignorance of, or inattention to the proper manner

of constructing ventilating furnaces has also been a frequent cause of fires in coal-mines, but probably the most fruitful cause of these disasters is the ignition of fire-damp, or carburetted hydrogen in coal mines; the ignition first produces explosion, and in mines yielding an inflammable coal it frequently ignites the fine particles blown about in a burning atmosphere, and these communicate the fire to the solid coal of the pillars; or the gas may continue to burn at some "blower" till it has ignited the coal in which the fissure or vent occurs. These so-called *accidents* are generally due to carelessness in the use of "open" lights, or in the opening of safety-lamps in places where the gas exists in quantity. The practice of blasting in coal-mines, which produces large quantities of the dangerous gas, has also caused a great number of deplorable explosions and fires; and the question of substituting some other agent, such as water, wedges, etc., for powder in mines of this kind, is now receiving much attention among European mining engineers. "Fiery" mines, such as those in the Richmond (Va.) bituminous basin, would be greatly benefited by the successful substitution of a safer agent for the powder now used where rock or hard coal has to be mined. In our anthracite mines, the hardness of the coal would render the use of powder more necessary, while the smaller quantity of fire-damp found in it would, at the same time, make the substitution of a safer agent less desirable. The exercise of greater vigilance in the inspection and use of safety-lamps would, doubtless, greatly diminish the number of explosions and fires in coal-mines.

Many bituminous coals, and bituminous shales which are found among the coal-beds, are, under certain circumstances, subject to "spontaneous combustion." This always occurs where the coal or shale is crushed in a confined space with an exceedingly feeble ventilation—indeed, spontaneous heating of the coal, accompanied as it is by an abundant production of carbonic-acid gas, was generally attributed to the decomposition of iron pyrites (sulphuret of iron) under the influence of the moisture in the air, and a circulation of air so languid as not to dissipate the heat generated, while sufficient to supply the oxygen necessary to support combustion. It has, however, been observed that the coals producing the greatest quantity of pyrites are not always the most subject to heat spontaneously, while it has also been noticed that the most inflammable coals are those containing the largest proportions of oxygen; it has, consequently, been suggested that the more probable cause of spontaneous combustion may be the combination of oxygen with the carbon, under the influence of moisture, and which is accompanied by the generation of carbonic acid and a considerable amount of heat. In the coal mines of Silesia, where cases of spontaneous combustion are of frequent occurrence, numerous observations have demonstrated that this class of accidents need not be feared where the "roof" of the vein is either sandstone or conglomerate nor near the outcrop, whatever the nature of the top rock may be; on the other hand, beds worked at a considerable depth, or even when moderately near the surface, but covered by a shale capable of being softened by moisture, are the most liable to spontaneous combustion.

It was long considered in Silesia that the only means of preventing fires from this cause consisted in sending all the fine coal, "waste" or "gob," out to the surface. This was often impracticable, expensive, and not always effectual; hence other means of attaining the same end were sought for. Since it is well known that combustion cannot exist when deprived of oxygen or air, one means of preventing spontaneous combustion consisted in isolating the working places, or goaf, by means of a heavy dry wall, or by two parallel walls filled in between with clay or other material packed hard, and sometimes a heavy pillar of coal was left for the same purpose. In each case, however, the weight of the superincumbent rocks almost invariably crushes the walls or pillars, and produces cracks or fissures, through which air, sufficient to sustain the slow combustion of the coal, can pass. This method has been employed with greater or less success in some of the mines in the centre of France, and in the thick seam of Staffordshire. It is evident that when used, the greatest possible care must be taken to keep the fissures closed, which are found from time to time, so as to seal hermetically the space enclosed. But besides the practical difficulty in effecting this, the fact that these enclosed spaces generally fill with fire-damp, and therefore form veritable magazines of a substance far more dangerous than powder, and which, through the crushing of a wall or pillar, or the fall of a portion of the roof, may at any moment be brought in contact with the lights of the men working in fancied security in the neighboring roads or chambers, is a sufficient reason for condemning so dangerous a system as that of isolation of the "goaves" by "pack walls."

The spontaneous heating of coal is so slow a process, that the increment of temperature is easily carried off by a moderately rapid current of air; we can thus prevent the temperature from ever rising to the point of ignition, by simply ventilating the "goaves"—this, then, is the exact opposite of the last method; and though much safer and fully as practical, yet very serious objections can be made to it. It is all but impossible, owing to falls, etc., to keep the "goaves" sufficiently open to maintain the necessary circulation of air, and the expense of clearing up falls and opening the old workings, where obstructed, is so great as to render this method impracticable in many cases. The system is, however, more or less successfully used in many mining districts in England. Silesia, etc. There now remains but one other method to describe, and it is by far the safest and most efficient in the prevention of danger by spontaneous combustion; it consists in filling or packing with earth and other material sent down from the surface the spaces from which the coal has been removed, and which the waste of the mine does not fill. This method, though somewhat expensive in large seams which make but little waste, is assuredly the most effectual remedy, since it not only prevents the admission of air to the old workings, and therefore does away with the expense of ventilating them, but it prevents the falls of the roof, in which "blowers" are frequently opened, and renders impossible any accumulation of fire-damp, which is the great source of danger in the method of isolation by pack-walls, etc. Thus this method not only procures perfect immunity from danger by spontaneous combustion, but the system of mining of which it is the principal feature enables us to obtain all the coal of the vein. It is, therefore, not only the safest, but also, as regards the amount of coal obtained, the most economical method now in use, and it is deservedly popular in Europe, and more especially in France, Belgium, and Germany, where it has been employed for a number of years, and has now taken the place of every other system in most of the coal mines.

Whatever precautions may have been taken to prevent fires, yet the carelessness, ignorance, and sometimes the malice of men are causes which cannot always be effectually guarded against; hence we must be prepared to meet the danger of fire when it occurs, and to apply *promptly* the most suitable means for its extinction.

[To be continued.]

Another Lamp for Lighting Mines.

SOME London inventors propose to use for the lighting of mines, lamps burning gas, oil, or other illuminating materials; but instead of allowing the said lamps to draw the air proper for their combustion from that surrounding them, to furnish them with air propelled from a pure source at the bottom or top of the shaft. They propose to convey the air to supply the combustion in air-tight tubes to the interior of the lamps, supplying a greater quantity of air to the said lamps than is necessary for the combustion of the gas or other illuminating material, the overplus being allowed to blow gently out by escape-valves or covers near the top of the lamps, thereby preventing the entrance of foul air, or air which has become mixed with inflammable gas in the mine, known as fire-damp. By preference, they glaze the lamps about half their height with glass, the upper half they prefer to make of sheet metal to withstand the heat. They furnish dampers to the lamps, so constructed that when the proper supply and pressure of air is supplied the damper is elevated, but if the supply of air is withheld the damper will descend or collapse and extinguish the light, or turn off the supply of gas, according to the kind of lamps used. These dampers may be fitted in connection with the escape-valves above referred to. When gas-lamps are used, the gas is produced and conveyed in pipes in the usual way. The air is propelled through the air-tight tubes above referred to by any well-understood method, such as by fans, air-pumps, steam-jet, etc. In lighting the lamps they propose to use safety matches, such as those manufactured by Bryant & May. After the match is inserted into the lamp by the escape-valve above referred to, it is struck, and the lamp is lighted. The lamps are furnished with tubes into which the lighted match is thrust and thereby extinguished before it is withdrawn.—*Colliery Guardian.*

A Novel Method of Transportation.

THE English journals tell us of a novel kind of railway now in use in Leicestershire, which seems to serve a very good purpose. In its construction there is no necessity for tunnels, cuttings, embankments, viaducts, and the like, whatever be the configuration of the country traversed. It consists of a wire tramway, the following summary of which we append:

The wire tramway provides a simple and cheap substitute for a line of rails, and is of great service where, from the scarcity or intermittent character of the traffic, or the engineering difficulties of the ground to be got over, it is either not expedient or impossible to go through the expensive process of forming a local railway. For the wire spans over and evades obstacles in place of burrowing under or levelling them, and will perform its task as easily along a rugged tract of country as on the smoothest road. The experiment being now prosecuted with complete success between some Leicestershire stone quarries and a railway-station three miles distant consists of an endless wire rope, supported on a series of pulleys carried by substantial posts, which are ordinarily about one hundred and fifty feet apart, but the interval between which may be greatly extended, as is shown in one case where the span from post to post is six hundred feet. One of the ends of this rope passes round a Fowler's clip-drum, worked by a portable steam-engine, and this drives the rope at a speed of six miles an hour. Boxes are hung on the rope at the loading end near the quarries by a pendant which is ingeniously arranged to preserve a perfect equilibrium, and at the same time to pass without hindrance over the supports. Each of these boxes carries one-hundredweight of stone, and the delivery is at the rate of two hundred boxes, or ten tons per hour for the three-mile distance.

Already wire tramways on the Leicestershire model are in course of erection in France, Italy and Spain. Negotiations are on foot, too, between the Turkish government and the engineers here, and it is not improbable that this generation may see goods carried by wire as commonly as messages. The tramway is, indeed, not unlike an exceedingly stout electric telegraph; and there is something almost droll in the sight of a regiment of well-laden trucks or boxes passing gravely along it at stated intervals, and at a regular pace, much as if they were at aërial drill. The most important point in Mr. Hodgson's invention is his method of passing the points of support, which consists in so curving the frame of the truck or box as to make the centre of gravity come under the rope. So admirably is this managed that some of our leading engineers have been discussing quite recently the possibility of constructing a stout wire tramway between Dover and Calais, which should be supported from a line of pillars sunk in mid-ocean, and along which passengers could be conveyed. The cost would be comparatively small, and suspensory trains could, it is argued, be despatched across the Channel without difficulty or danger.

It should be stated that where heavy loads must necessarily be carried, a pair of stationary supporting ropes, with an endless running rope for the motive power, are employed, and that by these means as many as a thousand tons per day can be easily conveyed. The cost of erecting these tramways in England, and of supplying motive power and rolling stock, is from £250 a mile for carrying fifty tons a day, in boxes holding half a hundredweight each, to £1500 a mile for one of the double-rope lines, to carry one thousand tons a day, in boxes or trucks holding six-hundredweight each. For all districts where there is traffic, but where it would not pay to construct a railway, the wire tramway is particularly applicable, and, as will be readily understood, wherever there is standing-room for posts, there a line can be erected. A recent application from traders in copper for putting one up for them, which should run through an African forest, and over an African jungle down to the coast, illustrates the varied circumstances under which the new system of transport may be applied.

"Heat Unit—New Method of Determining."

TO THE EDITOR—SIR: Under the above head there appears on page 35, current volume, of this journal, an article from a correspondent, which consists, perhaps, of as large a series of misconceptions and errors as ever was published. They would not deserve notice, were it not that the labor spent in disproving them will give occasion to many instructive remarks, useful to those who are investigating the principles of modern mechanics. The writer attempts to throw doubts on the correctness of the universally adopted mechanical equivalent of heat. This fact alone shows that he is unacquainted with the different methods by means of which it is obtained, and which corroborate one another in such a manner as to prove that the equivalent of 772 foot-pounds for one Fah. unit of heat must now be considered as one of the most firmly established truths discovered in our time. Moreover, the nature of any of the reliable methods by means of which this number may be determined with any sufficient degree of accuracy is such, that even if perhaps future investigations should cause slight corrections to be made, these could only tend to diminish it. It is certain that 772 is the maximum, it cannot possibly be more, although the correspondent alluded to, comes to the conclusion that it is 1168 foot-pounds for a Fahr. unit of heat. The method by means of which he arrives at this result I will now consider critically.

1st. He starts with the misconception that a one-hundred-pound cannon-ball, passing in a direction almost horizontal, with a velocity of one mile per second, possesses a force equivalent to 100x5280x60, or 31,680,000 foot-pounds, equivalent to 960 horse-power. It is a common error with many to suppose that a foot-pound means a pound moved one foot in any direction. *A foot-pound is one pound lifted one foot high against the force of gravitation*, and one-horse power is equal to 33,000 pounds lifted one foot high in one minute. If the one-hundred-pound cannon-ball were lifted upward to the height of one mile in one second, then the force acting on it would be be equivalent to 960 horse-power—not so now. To put the absurdity of this calculation in a clear light, let the writer of the article in question estimate, in accordance with this rule, the horse-power of a locomotive of 25 tons weight, drawing a train of 175 tons with a velocity of 40 miles per hour. He will find it 42,700 horse-power, which number represents in reality, however, the power required to lift the whole train of 200 tons weight upward with a velocity of 3520 feet per minute.

2d. Another error in this calculation is the introduction of the 60 seconds. A 100-lb. cannon-ball moving through a space of only 5280 feet can never represent a force of 31,680,000 foot-pounds. It can only amount to 100 by 5280, or 528,000 foot-pounds. However, when reducing this to horse-power, we divide it by 33,000, if the space of one mile is passed over in one minute, and by 550 if passed over in one second; a horse-power being also equivalent to 550 foot-pounds per second. This gives, therefore, 960 horse-power, which the writer referred to would have accidentally correct if the ball went upward the distance of a mile at the velocity mentioned.

3d. There is an error in the calculation of loss in velocity on account of gravitation. In case the ball is fired vertically upward, this is only 32 feet, or 3200 foot-pounds during the first second. When fired at the small angle of 6¼ degrees with the horizon, it is necessarily much less, by no means being equal to more than four million foot-pounds.

4th. The estimate of loss on account of the friction of the atmosphere is the most influential agent disturbing the course and velocity of cannon-balls; it is put down at "about" 401,912 foot-pounds. If we consider—taking the surface of the ball at about 70 square inches, and moving with such a velocity—that it leaves a vacuum behind and undergoes the steady atmospheric pressure before it of nearly 15 pounds per square inch; and that a wind moving with a velocity of 5280 feet per

minute exerts on a surface of 70 square inches a pressure of 9 pounds, and if moving at 60 times that velocity, will exert a pressure of at least 3600 times that amount; and that this is a constant, directly retarding pressure; and, further, if we consider that Hutton has proved that the resistance of the air to moving cannon-balls follows a much greater increase than the square of the velocity, and that this calculation is one of the most complex of the science of balistics, we see that the number adopted of "about" 401,912 is very uncertain—in fact, nothing but a mere guess. Moreover, the direct resisting pressure is independent of atmospheric friction, which alone is mentioned. If we wish to be correct in the estimate of this powerful influence, we must take into account the condition of the surface of the ball, whether it is rough or smooth; whether its form is a nearly perfect globe or elongated; whether, by the process of discharging it, it has obtained rotary motion; what its density is, since the effect of the resistance of the friction of the air will be inversely proportional to this density; whether this density is or is not homogeneous, as the influence of the last mentioned conditions has been practically demonstrated by the fact that pressed leaden rifle-balls possess a considerably longer range than cast ones; and, finally, the state of the atmosphere in point of humidity as indicated by the hydrometer, and of pressure as shown by the barometer. The latter, it may be remarked, varies from one day to another, often as much as two or three inches of the length of the mercurial column, and corresponding to over one pound pressure per square inch. For this reason, we may, when introducing the atmospheric pressure into our calculations, safely neglect fractions, and adopt the round number, 15 pounds per square inch.

5th. The elasticity is computed at the entirely arbitrary number of 1,266,000. For this there is not the least ground. It is wisely called "approximately equivalent," and would be so if it was ten times larger or ten times smaller.

6th. The resistance of the target is put down at 316,800 foot-pounds. The resistance of the target stops entirely the forward motion of the ball, so, at least, any one would reasonably expect; but according to the writer referred to, it does not, from the fact that he sums up these resistances, subtracts them from the original velocity, of which they constitute about one fifth, and has four fifths left to be accounted for, by a sudden change into heat without resistance.

7th. In place of acknowledging that every thing which has impeded the progress of the cannon-ball will have caused a rise of the temperature of the ball or of its surroundings, these retardations are called simply losses, as if there was such a thing as loss of power without a rise in temperature. When the ball strikes the target, there is left in it, according to that writer, nearly 25 million foot-pounds of what is now called "unconverted velocity." The query is, what has become of the converted velocities? Modern mechanics does not acknowledge losses when the subject of mechanical equivalents is under discussion.

8th. It is stated that light and electricity have not been taken into account, and that purposely, as if the influence of these agents on moving cannon-balls had been not only demonstrated, but numerically determined. One may as well talk of neglecting the influence of the earth's magnetism on the iron of the ball, or of the phases of the moon and the ocean tides at the moment of the experiment. These agents would have more influence than light and electricity, nevertheless it would be so infinitely small as to defy computation.

9th. It is taken for granted that when striking the target the ball alone becomes hot, and that the iron target remains perfectly cold. Now, it is evident that the heat will diffuse itself about equally between the two. Undoubtedly a larger mass of iron will be heated in the target than in the ball, but to a lower degree of temperature. However, the number of heat units will be nearly equally divided, so that the 20,484 Fahr. units the ball is calculated to obtain will be only half of what is really developed. The target will have obtained an equal amount. The total must therefore be 40,968, which, when considered the equivalent of the 24,919,878 foot-pounds, will give only 584 foot-pounds as the equivalent to one Fahr. unit of heat, in place of 1168.

This would be the necessary result of the calculation, if all the other assumptions were correct. As it is, this attempt at arriving at the mechanical equivalent of heat is crude. It contains so many arbitrary numbers, that, by changing them—and that, too, always remaining within reasonable limits of apparent truth—we may prove the equivalent of a Fahr. unit to be as well 100, 300, 500, 1000, 1500, etc., as 584 or 1168 foot-pounds. DR. V.

NEW-YORK CITY, July 22d, 1869.

Iron and Steel Crystals.

MR. SCHOTT, of Ilsenberg, has made many microscopical examinations of the structure of steel and iron. He maintains that "all crystals of iron are of the form of a double pyramid, the axis of which is variable, as compared with the size of the base. The crystals of the coarser kinds, as compared with those of the finest qualities of crystalline iron, are of about twice the height. The more uniform the grain, the smaller the crystals, and the flatter the pyramids, which form each single element, the better is the quality, the greater is the cohesive force, and the finer the surface of the iron. These pyramids become flatter as the proportion of carbon contained in the steel decreases. Consequently, in cast iron and in the crudest kinds of hard steel the crystals approach more the cubical form, from which the octahedron proper is derived, and the opposite extreme or wrought iron has its pyramids flattened down to parallel surfaces or leaves, which in their arrangement produce what is called the fibre of the iron. The highest quality of steel has all its crystals in parallel positions, each crystal filling the interstices formed by the angular sides of its neighbors. The crystals stand with their axes in the direction of the pressure or percussive force exerted upon them in working, and consequently the fracture shows the sides or sharp corners of the parallel crystals. In reality, good steel shows, when examined under the microscope, large groups of fine crystals like the points of needles—all arranged in the same direction and parallel.

New-York and Newark Ship Canal.

A MOVEMENT is now well under way for the building of a ship canal from New-York to Newark. A contemporay discusses in regard to the project as follows:

It is proposed to construct a ship canal from the lower part of our city across the meadows to the bay, thence across Bergen Neck, in almost a direct air line, to the channel of the Hudson river near Bedloe's Island. From the channel to the Bergen Neck shore, the canal will be 300 feet in width, with 16 feet of water at low tide, or nearly 22 feet at high tide; being of sufficient depth to accommodate the largest vessels entering the harbor of New-York. Piers or wharves will be built on each side of the canal, each 300 feet in width, to be filled in with solid filling of earth and stone. The outer sides of these piers will accommodate ordinary canal-boats and vessels of light draught, for loading or unloading, while the deep water of the canal will furnish wharfage for the largest ships and steamers. The value of these piers or wharves for wharehousing purposes can be readily appreciated.

Across Bergen Neck a cut will be made of 200 feet in width, with 10 to 12 feet depth of water at low tide, or 15 to 17 feet of water at high tide. Allowing for slopes, this excavation will be more than double the width of Broad-street below the canal-bridge. This land cut will be about one mile in length, and will average about thirty feet in depth. The canal then opens into Newark Bay on its east shore, where the water being very shoal, excavation will be made to obtain a sufficient depth of water, and piers or wharves built to protect the sides of the canal and afford additional wharfage facilities. Crossing Newark Bay, the canal is continued directly up to the city, keeping as near the high land as practicable, so that it may be more immediately available for business purposes. On this section, as citizens of Newark, we should be more especially interested. An artificial navigation is created, affording far superior advantages to our present river, not only by the gain in depth of water, but by the still more important gain of reduced distance to New-York (equal to more than one-half the present distance), and nearly six miles of wharf property is added to our city for commercial business and manufacturing uses. Our river-front is already all occupied, and some of our manufacturers have been compelled to build wharves on the opposite side of the river, in Harrison township, to meet their wants. That these canal wharves will be desirable for business and manufacturing establishments there is no doubt, and they will soon be appreciated by parties in New-York and elsewhere desiring to locate here, as well as by many of our own manufacturers, who would be better accommodated by a water-front.

When the canal is completed, a ferry will be established, making half-hourly trips to New-York, as the distance will be about forty minutes—being less time than is now occupied in going to New-York by rail from that part of the city. Owners of express-wagons and others who find it economy to do their own transportation by teams, will appreciate the advantage of this ferry, especially when they can be carried for little more than the present expense of tolls and ferriage, without taking into account the wear and tear saved to horses and wagons.

Altogether this canal will accomplish greater things for the future growth and prosperity of the city of Newark than all the railroads combined. Build this ship canal, and the city of Newark within ten years will contain a population of 500,000 inhabitants, and the business of the city in even greater proportion; our distance by water to the great city of New-York reduced to nine miles—forty minutes; our depth of water increased, so that vessels drawing fifteen to seventeen feet can come directly up to our city, escaping all the present bridges, which must tend to invite and induce manufacturers in other places more remote from the metropolis to locate their works here.

As an investment, this enterprise is safe and sure. The property alone created by its construction will be worth more than double its cost, even at a low estimate of its value. Its cost is estimated at between five and six millions of dollars while the property cannot be worth, when completed, less than twelve or thirteen millions of dollars. An opportunity is now offered for investment, which must yield large profits, while parties investing will have the satisfaction of aiding in the construction of an improvement of more general benefit to the city of Newark than any thing heretofore undertaken.

Railroad Items from the South.

THE Long Bridge at Washington has been condemned as unsafe, and passengers by the Great Southern Mail Route are now ferried from Washington to Alexandria. This beautiful ride of six miles affords an agreeable relief from the dusty coaches during the sultry heat of summer.

IT is rumored that the Chesapeake and Ohio Railroad of Virginia has been purchased by the Union Pacific Company for the purpose of furnishing an outlet of their own to the Atlantic coast. They are to prolong the road through Kentucky, and intersect westward with the lines under their control. A combination of this magnitude can elect the next President.

THE bridges over the James River, on the Southside Railroad at Lynchburg, Va., are to be rebuilt this year by Messrs. Maxwell, Grant & Co., of Macon, Ga. The style of bridge is to be the "V truss," the American sobriquet for the Warren Girder; the bottom cords being of wrought iron; top cords and braces of timber.

GENERAL MAHONE, the indefatigable President of the Consolidated Line from Norfolk to Bristol, paid the interest on his bonds for the whole line on July 1st, producing a very healthy rise in the price of said bonds. This is the first payment of the kind since the war, and is only one of many evidences of the truth of the term applied to General Mahone, "The Railroad King of the South."

THE Knoxville and Kentucky Railroad is to be pushed forward this year. Seventeen miles of track will be laid this summer, which will carry the line through the immense iron and coal tracts of Campbell, Anderson, and Scott counties, where there are enough of these minerals to supply the continent.

ARRANGEMENTS are being consummated which will insure an early completion of the Blue Ridge Railroad from Anderson, S. C., to Knoxville, Tenn. This very important line will be part of the grand scheme of connecting Charleston and Savannah with Louisville and Cincinnati. It passes through a region rich in copper and iron, and some gold fields in the western part of Carolina.

THE company of the East-Tennessee and Western North-Carolina road, from Johnson's Depot on the East-Tennessee and Virginia Railroad to Morgantown, N. C., is about commencing the laying of track. This road will open up an outlet from the celebrated Cranberry Iron Works of North-Carolina. This iron has, perhaps, the highest reputation of any in the market where its merits are known. Some recent tests showed it capable of withstanding a strain of over 73,000 pounds per square inch. This was an average of several experiments.

WORK has commenced on the Tennessee and Pacific Railroad, leading from Nashville to Knoxville, Tenn., and forming a very important link in the line of the proposed Southern Pacific Railroad. This line passes through a country abounding in fine lands, coal, iron, and timber. The thirty-mile division on the Nashville end has been placed under contract.

THE Alabama and Chattanooga Railroad is pushing forward its iron lines with great rapidity. It reaches through the widely celebrated coal and iron fields of North-Alabama, whose valleys abound in splendid farming lands and fine forests of yellow pine timber. This road will form the southern and southwestern outlet of the great line projected from Cincinnati to Chattanooga, Tenn.

THE North and South Alabama Railroad is under contract to be completed, from Montgomery to Decatur, early in 1871. This will open the direct route from the great Northwest to the heart of the cotton regions of the South. It passes through the heart of the immense coal and iron fields of Northern Alabama, besides some very fine farming and timber lands.

THE Georgia Air Line Railroad, from Atlanta to Charlotte, N. C., has been commenced at the former place, and the first division of twenty miles put under contract.

Queries.

K. B., OF PHIL.—"I hear that there is a method of making glue from old leather by removing the bark extract, which is, of course, the ingredient which changes a hide into leather. Is this true? If so, can you inform your readers of the process?" *Answer.*—Old leather scraps, boots, etc., are first washed, then cut into small pieces, and soaked from six to twelve hours in a solution of caustic soda, with a specific gravity of 1.025, or until all the tannic acid is extracted from the leather and combined with the soda, forming tannate of soda, which may also be recovered as tannin by precipitating this from the solution by means of some cheap acid. The leather scraps are then treated alternately with diluted acid and pure cold water, until all the soda is removed. The pieces of hide are then boiled with water in the usual manner in order to remove the glue. The principal precaution to be taken in this operation is to see that all the tannic acid has been removed by the soda, because, if only a trace is present, it will prevent the formation of the gelatine solution. With proper care, this solution may be either dried, like glue, or brought to a jelly.

S. B., OF OHIO.—"Glycerine being sweet, like syrup, I suppose it is made from this article by putting something in which prevents its drying. What is it? how can I make it?" You can easily put something into syrup to prevent its drying—for instance, chloride of calcium; but it will not be glycerine. Glycerine is an entirely different substance, notwithstanding its sweetness. It belongs chemically to the alcohol series. It is made by decomposing fats and oils, all of which consist of fatty acids, with glycerine as a base, in the same manner as glauber's-salts consist of sulphuric acid, with soda as a base. The manner of making glycerine may be found in the September number of the *Manufacturer and Builder*.

L. P., OF N. Y.—"How is genuine gold ink prepared? I have a sample perfectly liquid and writing like common ink, and yet the writing is not attacked by nitric acid, which, I think, proves it to be genuine gold." *Answer.*—Pure gold-leaf, such as gilders use, is mixed and rubbed with honey, until the gold is reduced to an impalpable powder. The honey is carefully washed out with water, and the gold deposit mixed with gum-water, in which it, if fine enough, remains in suspension. The writing done with such an ink may be polished with a piece of ivory.

MINING SUMMARY.

Review of Mining on the Pacific Coast.

WE take from the San Francisco *Commercial Herald* the following *résume* of mining operations on the Pacific slope for the three months ending with the close of last month. An interesting sketch of the progress and results of the White Pine discoveries, and the application of new economic mining appliances in the California and Nevada mining districts, are included in our contemporary's valuable report:

THE WHITE PINE MINES—THEIR EARLY HISTORY.

"It being now nearly a year since the people of California began first to hear much about White Pine, and a little more than half that time since immigration and capital began to flow actively into that district, a brief review of its history might not, just now, be altogether inopportune.

"One year ago, then, there were not more than three or four hundred inhabitants within the limits of the White Pine District, a large proportion of these being mere sojourners. The population, up to that time, and for a month or two after, was somewhat transient—people coming and going—because, while the ores were evidently rich, and the surface deposits apparently extensive, they could not satisfy themselves as to their probable permanency. Then, there were no mills or reduction works there, except the small establishment of the Monte Cristo Company, fourteen miles distant from the mines. No towns had been built—Treasure City and Hamilton consisting of a few rude cabins, not exceeding thirty or forty in number. No roads had been constructed, nor were there then more than two or three lodes in the district developed. The bullion product had, up to that time, reached only a few thousand dollars, being chiefly the proceeds of Eberhardt ore, the most of which had been sent to Austin for reduction. As yet, not a sample of these rich ores had reached San Francisco, nor was any thing known here of the wealth of White Pine, except what could be gathered from the vague rumors that had then begun to spread abroad. We then knew less of White Pine than we do now of a dozen other districts around it. In June, 1868, there were, probably, not over two or three hundred company claims recorded in this district—now there are more than four thousand: an increase not referred to as being a creditable achievement, or one likely to promote confidence in the district, the greater proportion of these locations being worthless, and not a few wholly mythical. During the months of June and July population increased slowly, and not much progress was made in improvements. In September more people came in, confidence in the mines increased, and every branch of business was marked by greater activity and energy. Roads, already laid out, were built, mills were brought in, and the owners of promising claims began to prospect the same on a liberal scale. No large sales of mining properties had, however, as yet been effected, and the price of town lots remained at low figures. By the middle of October one ten-stamp mill, erected by General Page, at Shermantown, had been got in operation; and, by the tenth of the following month, another of like capacity, put up by Jeremiah Miller, was running at Hamilton. The starting of these mills gave a new impulse to business, and people beginning to flock into the district, real estate, as well as mining claims, soon began to appreciate. By the middle of November a good many capitalists had already visited or were then collected at White Pine; and before the end of the following month a number of leading mines had been disposed of. During this period the Stanfords had bought the California and the South Aurora mines, and the Virginia, the Pocotillo, the North Aurora, Hidden Treasure, Featherstone, and several other valuable claims, had changed hands; the purchase money amounting, in the aggregate, to considerably over a million of dollars.

"Toward the latter part of December the winter set in with great rigor, continuing with but slightly interrupted severity, until the middle of May—seriously interrupting work in the mines, and preventing most kinds of out-door business being done to any advantage. During all this time—a period of four and a half months—very little could be accomplished, not only on account of the cold and stormy weather, but chiefly because there was no lumber or other material for building, no fodder for stock, and but very limited supplies of most staple articles of food.

"Throughout the whole of this inclement period, while the cost of living was enormous, and when little or nothing could be done, multitudes, disregarding the warnings against such a course given on every hand, rushed to White Pine, there spending their money and means, so that many were obliged to leave before the season for prospecting, or even seeing the mines to advantage, had arrived. These people, disappointed and disgusted with their experience, left the country, cursing its rigorous climate and denouncing the mines. In the mean time, thousands of worthless claims had been located, many of which the locaters, taking advantage of the reputation of the really good claims in the district, managed to dispose of, generally for small sums, parties excited by the rich ores exhibited being disposed, notwithstanding they had often lost by this sort of venture, to risk a trifle where the chances seemed so good. And thus it happened that large numbers of persons became interested in a small way in these mines during the winter, when little was or could be known about them, to find, on the approach of spring, that they had nothing to represent the property purchased, except, perhaps, a thread of spar or a bunch of barren quartz. The deceptions practiced in this manner have led to a widespread distrust of the White Pine mines, and done much toward discouraging investments in that region. It is an indisputable fact, however, that those who purchased properties at all developed, buying only on careful inspection, have in every instance done well, and could to-day realize two or three hundred per cent on their investments, and in some cases much more. In fact, never before have men investing in any mines had more cause to congratulate themselves on their ventures than those who purchased largely and intelligently at White Pine.

WHITE PINE NOW.

"Having shown how little had been accomplished in this district one year ago, we will briefly glance at the work since done, and the progress that has been made, as affording the best evidence of the enterprise and energy displayed by the inhabitants, and their confidence in the resources and future of the country.

"There are, then, at the present time, ten quartz-mills completed and running in the district. These mills carry an aggregate of 112 stamps, and, including sites, water, franchise, etc., have cost a total of not less than $600,000. Three considerable towns have been built, many of the structures being of a capacious and substantial kind. At least 150 miles of toll-roads have been constructed, at an expense of fully $150,000. Over twenty saw-mills and smelting-works have been put up. Immense quantities of wood have been cut, and many thousand feet of lumber manufactured. A vast amount of work has been done upon the mines, from which eight or ten thousand tons of ore have been extracted. A magnificent system of water-works has been projected and brought nearly to completion; besides which, a great many minor enterprises and improvements have been planned, and many of them executed; nearly all of which, it should be borne in mind, has been performed during the rigors of a long and dreary winter, with labor and all kinds of material at exorbitant prices.

"In and about the mines and mills there are now employed about 2000 hands, whose wages average $5 per day. About 3000 tons of ore are raised every week, of which not over a third is milled, for want of reduction facilities. The weekly product of bullion amounts to about $120,000, with the prospect of being increased at least one half within the next six months. The ore now being crushed averages considerably over $100 to the ton, each stamp crushing about a ton and a quarter per day. There have now been extracted from the White Pine mines very nearly $2,000,000, it being scarcely a year since the first crushings were made, and not more than six months since no more than three mills, all of small capacity, have been running on these ores.

THE COMSTOCK LODE, ETC.

"In the Comstock mines no important changes have occurred during the period under review. In the Hale & Norcross ground heavy bodies of good ore have been developed, imparting a stimulus to companies prospecting for ores in their lower levels in the vicinity. The Savage and Hale & Norcross may be classed as the most successful companies on the Comstock during the past six months. The fire in the Gold Hill mines proved a more serious affair, in a pecuniary point of view, than was at first anticipated; not that it damaged the mines so seriously, but from the fact that it was so long before it could be extinguished, causing a stoppage of mills, product of bullion, labor, and business generally.

"The product of ore from the various mines has been quite large, but the yield of metal per ton has been below what may be considered the average of last year. This, however, has been attended with a lessened expense, but not enough to make up the former aggregate profit per ton. The Carson and Virginia Railroad is being pushed with vigor, and will be completed within the coming quarter, an event that will cheapen transportation, and allow most of the ore to be reduced by water-power, thereby enabling the working of ore which otherwise could not be made to pay for reduction. Outside mines in Storey and Lyon Counties have contributed quite a large precentage of the ores lately reduced at the mills in that part of Nevada.

THE PROGRESS OF CALIFORNIA, IDAHO, AND ARIZONA.

"In California there has been less activity and change than in the State of Nevada, but at the same time a steady advance. The quartz interest especially has been quite active of late. In several of our more northern counties surface-diggings have paid handsomely, and in a number of places old diggings have been rewashed with profit. In most places, however, the old surface diggings have fallen into the hands of the Chinese, who are now found in nearly every ravine and gulch in the gold-bearing region of the State, though it is impossible to form any correct idea of their gains, further than estimating their time at $1 per day—a Chinaman never leaving when he can make that sum daily.

"The mining ditches that formerly yielded so largely, no longer pay, except in a few localities. The more extensive use of water for driving quartz-mills will, however, gradually cause this species of property to appreciate in value.

"The gathering of sulphurets carrying more or less of gold is gradually becoming a business of importance in surface-mining. Formerly, when large quantities of water were used for sluicing purposes, it was impossible to save these sulphurets. But with improved facilities and cheapened labor, this business can now be made remunerative, the only drawback to a much more marked success being the difficulty still experienced in extracting the metal after the sulphurets are collected.

"Quartz-mining has made satisfactory progress during the past half year, the only thing required to insure the general success of this great industry being cheaper machinery and labor. With any material reduction in the cost of the former, men of small means would be enabled to carry on operations on a limited scale, gradually extending them as their ability increased.

"A very considerable reduction in the cost of extracting the ores is likely to occur through the use of giant powder, and the introduction of the single-hand drill, it being shown by actual trials carried on through several months that ore could be broken out with giant powder at a cost of less than one half that attendant on its extraction by black powder. The principal objection urged by miners against the employment of this new explosive, that it is injurious to health, is considered untenable by many who have experimented with it on an extended scale. The late very general and long-extended strike of the miners in Nevada County, without settling the questions at issue—namely: the introduction of the giant powder, and the employment of the single-hand drill—has had a most mischievous effect in a variety of ways. Through this cause the laborers themselves have been thrown out of work and deprived of their earnings, while the mine-owners have lost the profits that they might otherwise have realized from the working of their ores. The product of bullion has been reduced, and business of all kinds in the vicinity has been made to languish; and, finally, the probability of Chinese labor being substituted for that of white men has been rendered imminent—a result that, however it might benefit the proprietors, could not fail to operate to the permanent injury of the white miner.

"A difference of one dollar on the cost of raising and working a ton of ore has now become the determining question whether many of our mines are to be worked or to remain idle—a point that the use of giant powder and single-hand drill will in many cases be able to settle in favor of a continuance of operations; a circumstance that renders the determination of this matter one of great practical importance.

"It is the opinion of many that quartz-mining is likely, in any event, to experience a decided expansion in California; the introduction of more effective methods of saving the metal, and the reduced cost of labor and machinery, coupled with a growing spirit of economy, tending to warrant this conclusion.

"The smelting-furnaces in the Cerro Gordo District, Inyo County, have been doing a largely increasing and profitable business of late, the crude metal accumulating to such an extent that it has been found expedient to erect refining-works, so that the precious metals may alone hereafter be shipped, the lead being retained to await increased facilities for transportation. New companies have lately commenced the construction of additional furnaces in that locality, and it will not be long until California will be producing silver in notable quantities.

"In Oregon, mining enterprise is being gradually extended, though not marked by any special activity.

"In Idaho, less is being done in the department of quartz-mining than formerly, owing, in part, to a large emigration from that Territory to the White Pine region, and in part to the recent disastrous failure of what was considered one of the representative mines of the country.

"From Arizona, more encouraging accounts reach us this year than have emanated from that country for several years past; and as a number of companies have fitted out in San Francisco with a view to making a more thorough exploration of that Territory than has ever yet been made, it may be reasonably anticipated that important discoveries will transpire in than quarter before the season is over.

"A new feature in the disposition of ores arises from the practice, now becoming prevalent in many parts of the State of Nevada, of sending large quantities of rich but rebellious silver ores by railroad to this city for reduction or a market; a method of disposing of this class of ores that will no doubt soon grow into general favor, in view of the satisfactory results that have attended these first trials. Thus far, more argentiferous ore has reached this city the present year than arrived during the last two preceding years.

TREASURE PRODUCT, IMPORTS, ETC.

"The receipts of treasure from all sources, through regular public channels, during the past six months, as compared with the same period in 1868, have been as follows:

	1868.	1869.
From California, Northern Mines	$18,724,410	$20,296,635
From California, Southern Mines	2,380,335	3,345,919
From Coastwise Ports, Oregon, etc.	1,971,814	1,949,808
Imports, Foreign, British Columbia, etc.	1,523,630	2,362,382
Totals	$24,503,189	$27,854,744

"From the above it will be seen that the increased receipts of treasure the last half year exceed those of a like period in 1868 by more than three millions and a quarter of dollars, a circumstance not due to any increase in the bullion product of the country, but to the transmission of larger sums by express, induced by diminished charges, and the large amounts requiring to be remitted on White Pine account, the latter amounting to a large sum in the aggregate. Much money has been required to be sent to that quarter during the past six months in the payment of freights, mill construction, work upon the mines, etc.; though a good deal of bullion produced there has, in the mean time, been shipped East by the railroad, diminishing to that extent receipts at this place."

Nevada.

THE COPE MINING DISTRICTS.

OF all the accounts that have recently appeared in print of this new mining district recently discovered in Northeastern Nevada, the following by a correspondent of the Silver City (Idaho) *Tidal Wave* is by far the most interesting that we have read. It is commendably free from the bombast usually found in articles of its class, and its general tone is truthful and confidential. The writer dates from Silver City, June 28th, and says:

"Having on Thursday last returned from a hasty visit to the Cope Mining District in Red Mountain, it is thought that a short description of 'what I saw and part of which I was' might be of interest.

THE RED MOUNTAINS,

a somewhat indefinite term as to boundaries, are located on, and extend along both sides of the Middle Fork of the Owyhee, or Duck River, as named to distinguish it from the other forks, for a distance of some forty miles. The river having its source near the southern extremity of these mountains, runs almost due north to the Cope diggings, where it turns to the westward, and after running through a rough cañon about twelve miles, enters Duck Valley, a magnificent body of land containing several thousand acres of excellent soil. Near the foot of this valley is the point where the Idaho Central road is to cross the river. Several of the highest points of these mountains are yet covered with snow, thus indicating an altitude probably greater than that of War Eagle, receding toward the streams in lower mountains and undulating hills, leaving very few abrupt cañons or precipices. Nature seems to have done every thing for this country except supplying it with timber, there being nothing of the kind suitable for lumber, yet there is said to be an abundance of mahogany and some white fir that will answer the purposes of fuel and mining timbers. The adjacent valleys are thickly set with a luxuriant growth of wild timothy, blue-joint, clover, and other excellent grasses, and the hills and mountains are universally covered with a heavy coating of bunch grass, making it equal, in summer at least, to any grazing country in the world. Crystal streams water the country in every direction, in which trout are as common as crickets on the Jordan.

THE MINES

were discovered about two months ago by a party from this place, consisting of A. J. and Jesse Cope and Thomas Mellinger, and are located about one hundred miles south, and from thirty to thirty-five miles to the eastward of this place, near the bend of the river, about thirty miles above the crossing of the Idaho Central road. The only ledges that have been prospected at all are within three hundred yards and not more than two hundred feet above the level of the river. Only one of these ledges—the Argenta—has been developed to any extent, and that not to exceed the depth of four feet. The discoverers had no tools but those with which they were prospecting, and consequently had done but little work. A train arrived, however, while our party was there, with blacksmiths' tools, etc., so the work will now go on with renewed energy. Three tons of ore have already been shipped to Washoe for reduction, the result of which will establish the value of the ore. There can be no doubt as to the rich quality of the Argenta ore; and several other ledges—the Pioneer, Excelsior, California, etc.—show about as good croppings with probably a greater width of vein matter. The only question as to the permanency of the camp is in regard to the ex-

tent of ore, the Argenta only showing about one foot of quartz, and in fact that was not sufficiently defined at the time I saw it to give positive assurance of a permanent ledge, yet, in all human probability, it will prove to be such. The mines are situated in a narrow belt of granite running nearly north and south. As to placers, none had been discovered up to the time I left which gave sufficient promise to justify working, although colors had been found in many places, and washed gravel, bar formations, and other indications of gold appear on several of the small streams. A town has been laid off on the northeast bank of the river, where there is plenty of level ground for the purpose, in which are some half a dozen tents—one a store—and generally from twenty to forty people; it is claimed, however, by the 'oldest inhabitants' that there are as many as a hundred men scattered promiscuously through the mountains. It was the opinion of our party, after vainly searching three days in the vicinity for some mark of civilization, that they must have been terribly scattered. It is but justice to those of *us who were not lost* to say that one of our number got astray and accidentally stumbled upon the camp, arriving two days in advance of the others. The town, as yet, has no established name; some at the camp suggested 'Mountain City.' A long name, and especially the addition of 'city' to the name of a small town, is particularly horrible. The *Wave* has already given it the name of 'Copo,' which is much more preferable and appropriate. Although this camp may at some future day become a place of considerable importance, it will not justify a great number of people in going there at present to do business, as there is no business to be done, and will not be for this season at least. I believe it may be a good field in which to prospect, and those who go there will do well to go prepared for that purpose only.

THE ROAD.

"We took the Idaho Central, and travelled it as far as it has been completed, but in crossing the lava plains near Battle Creek, where nothing short of giant powder could make a mark, and at the time being in a very heavy thunder-storm, we lost our way, and consequently did not follow the line of survey. I am compelled to report favorably upon this road as far as it is finished—that is, to a point about fifty miles south of Silver. The grades over War Eagle and through the Boulder Creek country really constitute the best part of the road, the ascents and descents being so gradual that a team might readily trot over the entire distance. The lava belt of Battle Creek, although in a level plain, will be the most difficult part of the whole route, it being so entirely covered up with boulders of every conceivable shape and size, and scarcely enough dirt in places to cover the track. In fact, at this point, it seems a very similar case to that of the Irishman with his new boots, who thought he would never be able to get them on until he had worn them a week or two. To an outsider it would appear that this belt would be almost impassable for teams until it had been used at least one season; but from the known energy and ability of those having the road in charge, and considering the sum already expended upon it, it is not at all likely that so narrow a strip of country as this is, no matter how difficult, will be allowed to stand in the way."

THE EBERHARDT MINE.

THE *Inland Empire*, of recent date, gives the following glowing description of this famous mine: "The name of this mine has become familiar to every one in this district. It is not our intention to give a history of its discovery, nor to pass any eulogy upon it; but to give a plain statement of what we saw and what conclusions we arrived at from a careful inspection of the mine. On Monday last, while making the rounds of the mines of Treasure Hill, we called at the Eberhardt, and introduced ourself to Mr. Bicknell, the Superintendent, who kindly extended to us an invitation to go down into the mine, which was accepted. We were soon afterward at the first level of the mine. At this point the most of the ore which has been taken from the Eberhardt proper has come, yet in but one single place has it been opened larger than one floor with six-foot posts. At one point a space of ground of some ten feet square was excavated below the floor to a depth of ten feet. On the south side of the opening below, the ore has been taken away from the south wall, leaving the wall perfectly defined, and as smooth as any wall we ever saw in the Comstock. The wall rock is pure limestone, without a particle of quartz or spar in it, and almost perfectly solid. Next to the wall is a stratum of quartz a foot thick, which is ground almost as fine as though it had been subjected to the stamps of a mill. Joined on to this is the rich chloride ore, of which none is being worked. The ore being reduced at this time is what is termed the black ore; although it has not a favorable appearance to the inexperienced eye, yet it yields about $6000 per ton by mill process. The ore in the mine seems to be divided into two classes—the black quartz and the chloride. In both kinds large boulders of barren rock, similar to the cap-rock found over nearly all the ledges, are met with. We do not propose to give any kind of an idea of the richness of the chloride stratum, for we know it would prove a failure; and if we did succeed, our readers would think we were excited, if nothing more. But we should say there is now exposed to the eye at least three million dollars' worth of ore. In some places there is "horn" silver two inches thick. Some ore was broken up from the floor of this station which was a perfect mass of "horn" silver. We were made the recipient of a piece of it weighing a little over a pound, which is worth $10.25. It is perfectly malleable. Although we have been through every level from the sage-brush to 1000-foot station of all the mines on the Comstock, and have seen them in their glory, yet we have never seen any thing that would do to compare to this great mine. The north wall is perfect, and is as true as the wall of a plastered room. Near the north wall a tunnel has been run west under the road a distance of two hundred feet; the whole distance was through ore of a very high grade. The ledge of pay ore, or ore that will mill from $600 to $18,000 per ton, is 183 feet wide, and how deep it will extend no one can tell. We saw some good ore from the shaft at a depth of 184 feet, although the shaft is in the edge of the south wall; but as soon as a drift is started across the ledge we may look for ore equally as good as that found on the first level (it can't be better unless the silver is coined). The mine at this time is employing but few men, and the most of those now working are prospecting. It requires but few men to extract all the ore required to keep their mills in operation. Should it so happen at any time that this mine should desire to take out $500,000 in a single day, they can do so, and not employ more than half the number of men employed daily in the Savage mine. In short, we will make a summary of the whole thing by saying we saw more good ore in the Eberhardt mine during our visit than we ever thought could exist. Second. It is a better defined ledge than we ever saw before. Third. It is a larger ledge than we ever saw, and, we believe, is the largest ever discovered. Fourth. It is our honest conviction that the Eberhardt will in time yield more silver than has ever been taken from all the mines on the far-famed Comstock ledge. Fifth. We have every reason to believe there are plenty of other mines in White Pine equally as rich as the Eberhardt, and some, perhaps, as extensive when they come to be developed. But at this time the Eberhardt is the chief of the earth as a silver mine.

"We were shown a piece of ore in the hoisting works of the Eberhardt, which was sewn up in a piece of green rawhide in order to keep it from being broken to pieces by visitors. The ore weighs 600 pounds, and $3000 has been repeatedly offered for it, but as often refused."

Pennsylvania.

THE BROAD TOP COAL AND IRON REGION.

The Kemble Coal and Iron Co.'s Furnaces at Riddlesburg in blast. Complete success of this pioneer enterprise.

AN esteemed correspondent at Huntingdon, Pa., sends us a lengthy communication clipped from a local paper, detailing the progress of the coal and iron industries in the Broad Top region. We regret that want of space compels us to publish only such portions of the article as relate directly to the new iron-furnace just completed at Riddlesburg for making iron with the coals of the Broad Top Region. The correspondent telling of the difficulties incident to the starting of the enterprise, says: "It required capital to erect furnaces, and most of those familiar with the resources of Broad Top had already largely invested in its coal lands and coal business. Besides, there were other questions which came up in the discussion: *Will your Broad Top coke make good iron? Are you sure you have abundance of iron ore?*

"The coke had not made iron in this region, and hence suggested a doubt in the minds of capitalists. True, the iron ores had been thoroughly tested, for they had been and were now being smelted at various points in the region with charcoal. But as the primeval forest was fast disappearing and the charcoal iron-masters looked aghast at the widely increasing circle of their charcoal supply, the continuation of this mode of iron-making could not be entertained. And here, for a brief time, the matter rested. Presently the Cambria Iron Co. began shipping these ores to smelt at their works. *If they could be successfully worked at Johnstown with coke, why not in Broad Top?*

"In 1867, L. T. Watson, Esq., then President of the Huntingdon and Broad Top Railroad, introduced this matter to a number of New-York gentlemen, who visited the region and purchased coal and iron ore lands, soon after organizing a company under the name of the Kemble Coal and Iron Co., of whom the Hon. William Kelly is President, L. T. Watson, Esq., Vice-President, and R. A. Wright, Esq., Secretary and Treasurer.

"During the following year they commenced the erection of a large furnace at Riddlesburg, which has been completed and is now in blast. The construction of the furnace, after a design by F. Rumpf, Esq., of New-York city, was entrusted to David Worden, Esq., the present Superintendent, under whose superior skill and untiring energy, this noble furnace has been brought to a successful completion. The furnace is 14 feet wide at bosh, 8 feet at tunnel-head, and 60 feet high. Its outside form is a truncated pyramid, having a base of 32 feet square. The masonry is heavy coursed, well banded, ashlar work, of Mahoning sandstone. The tuyere arches are turned with hard, red brick, and the interior of the furnace has a double lining of 21-inch fire-brick. The blowing engine is of the most modern and approved plan, possessing sufficient surplus power to increase the blast, over the usual pressure of 3½ to 4 pounds per square inch, in any exigency which may arise in its working. A pumping attachment supplies water to the water-lift for hoisting the ores and fuel and for the various uses incident to a large furnace. The hot-blast oven is erected after the improved Player patents, which insures a high heat equally diffused over the cast-iron heating-pipes, and is not injuriously concentrated at any one point. Ample boiler-room has been provided and the furnace-gases utilized in making steam and heating the hot-blast oven. Indeed, the whole improvements and appliances, regarded in all the elements of strength, stability, ample power, skilful construction, and embodying the most recent improvements, has excited the admiration of all who have visited it. It is located at the village of Riddlesburg at the mouth of Six Mile Run; it has coal 1½ miles above it, and abundance of red hematite iron-ore at Tatesville mine, ten miles south of it. All these supplies are alongside and carried over the Broad Top Railroad to the furnace at Riddlesburg.

"The furnace was put in blast July 3d. During the first week of its operations it has made 86¼ tons of superior No. 2 gray foundry metal. When full load and blast shall be attained, it is expected that 150 tons of metal per week will be produced. The operations thus far have demonstrated the main question — the excellent quality of Broad Top coke. During the progress of the construction of this furnace, explorations west of Markiesburg developed the presence of a *mammoth* seam of rich iron ore along the flank of Tussey's Mountain. There it was opened 9 feet thick. Recent openings on the same deposit traced to the Powelton Coal and Iron Co.'s lands, west of Coffee Run, show a solid seam of iron ore 21 feet thick! This is not a 'pocket,' but a continuous seam of excellent iron ore, in the Levant series, Clinton group, and extending as far as the measures extend in which it is enclosed. The ore has been used and tested in the furnaces of the Cambria Iron Co. and declared excellent. Who shall map out the future of Broad Top, with its inexhaustible supply of coal and coke on the eastern flank of its railroad, and its inexhaustible supply of rich iron ores along its western flank? We hail with unmingled delight the dawn of the iron era, in the Broad Top Coal and Iron Region.

"SAXTON, PA., July 10th, 1869. J. F."

Michigan.

THE COPPER MINES.

THE Houghton *Mining Gazette* has the following items of news from Ontonagon, dated June 23d:

"The Minnesota Mining Company have commenced sinking a shaft on their south range of veins. At the Flint Steel mine they are making preparations for building a stamp mill by clearing off the ground, grading roads, and other surface improvements. The Knowlton is still keeping up its general average product for the number of men employed. The Ridge mine is looking first-rate—in fact, better than ever before. At the Aztec mine the show of copper is not so good as it has been, but they are trying various experiments to reduce the cost of production, such as drilling-machines, gas-lighting fuse, nitro-glycerine, etc., and it is to be hoped that they will meet with success with some of them at least."

COPPER PRODUCTS FOR JUNE.

Franklin Mine—mass, barrel and stamp, 73 tons, 658 pounds; Pewabic Mine—mass, barrel and stamp, 50 tons, 127 pounds; Huron Mine—mass, barrel and stamp, 60 tons, 200 pounds; National Mine—mass, barrel and stamp, 20 tons, 1104 pounds; Quincy Mine—stamp work, 125 tons, 1070 pounds; Isle Royale Mine—mass, barrel and stamp, 34 tons, 1427 pounds; Hancock Mine—mass and stamp, 31 tons, 1688 pounds; Ridge Mine—mass and barrel, 23 tons, 453 pounds; Evergreen Bluff Mine—mass, barrel and stamp, 13 tons, 1847 pounds; Knowlton mine—barrel and stamp, 10 tons, 1030 pounds.

THE IRON DISTRICT.

CORRESPONDENCE from Negaunee, July 15th, reports:

"At no time during the season has the demand for iron ore been so great, and all the mines shipping over the Peninsula road are working to their utmost capacity to prevent detention of their vessels at Escanaba. Although the recent heavy rains have caused them great inconvenience, they have done admirably, and have saved the expense of damage.

"The Foster mine received orders this week for three cargoes of hematite, and it is being shipped rapidly. Six hundred and fifty-six tons have gone down in the last three days.

"We learn that the company lately organized to open up and work the Cascade property will be here next week with every thing arranged for immediate action. All the machinery for the Barnum and Pioneer openings of the Jackson has arrived and will be set up at once. This will greatly facilitate both the mining and shipping of these mines."

Colorado.

NEW GOLD DISCOVERIES.

WE find the following brief notice of reported new gold discoveries near the northwestern border of Colorado, in the Cheyenne *Leader*:

"Some two weeks since a party of men arrived here, bringing accounts of rich placer mines, ninety miles from this place. They exhibited specimens of gold of fine appearance, which they had obtained from a rough sluice, constructed from a wagon-box. The exact location of this discovery has been kept secret until within a few days. A party, embracing the original discoverers and some friends, left this city this morning for the new diggings. They go as far as Sherman by rail, and then by wagons or on horseback. The mine is in a southwesterly direction from Sherman or Laramie, being equally distant from either point, and are situated on the edge of the basin of North Park, and beyond the North Platte River. They are not far from the 'Last Chance' District, of Medicine Bow Mountains, and lie some forty miles south of the Colorado line."

The Laramie *Sentinel* has the following additional about these mines:

"Some boys in from the mines report that three men worked at sluicing two days, and cleaned up sixty dollars in gold. They had but three lengths of sluice. The water is getting down so that they can work to better advantage. They have been using the high water to strip the ground sluice, and they think that a good deal of gold will be taken out in a few days to come. The greatest drawback now is the want of lumber, which can only be obtained by the slow process of whip-sawing, there being no road to get in with wagons. There is to be a road built into the mines immediately, parties have already undertaken the job."

NEW FURNACES AT MILL CITY.

We learn that Mr. Bateman has recently arrived at Mill City, from the east, for the purpose of putting in running operation the Mill City Gold and Silver Mining Company's Mill. The old Mason roasting-furnace will be taken down, and three others erected—one a reverberatory, and the other two of a different pattern. We hope he may be successful, as they are greatly in need of mills at that place.—*Georgetown Miner.*

Idaho.

THE NORTHERN MINES.

A CORRESPONDENT of the Silver City *Tidal Wave*, writing from Lewiston, June 28th, says: "The general drouth that prevails in our Territory is quite as great here as in other portions. Of course I cannot give any flattering accounts from the mines, or say any thing very encouraging about their present or future prospects. The country is fairly parched up, and no prospect of rains.

"The Moose Creek mines have proven a failure. Miners are coming back every few days, and all the reports are unfavorable. There have been a very few paying claims, but the ground is limited and water scarce. There were at one time four hundred men in the camp, but there are not over fifty in it now, and there won't be over thirty there after this month.

"There are more men in Florence than last year, but not as many in Warrens. In Oro Fino and Elk City, reports give about the usual number of men. The placer mines will fall short of the usual yield, owing to the scarcity of water. There is some encouragement from the quartz mines in Florence and Warrens.

"Since the white men have come back from Moose Creek and told their story, the Chinamen think it is a good place for them, and they are busy fitting out and starting for these mines. They will be likely to make it pay, and we wish them good luck. If white men can't afford to work the ground, they should give the Chinamen a chance."

South Wales.

EMIGRATION FROM THE MINING DISTRICTS.

A STRONG feeling in favor of emigration is once more being evinced among the colliers and iron-workers of South Wales, and at this early period of the year a large number have left for the United States and the colonies. Every Monday after a "pay" the principal railway-stations are crowded with emigrants and their friends, who are assembled to give them a parting farewell on leaving their native localities. The slackness in the demand for coal, with the consequent irregular employment at the collieries, has given quite an impetus to the movement, for the great majority of the colliers have not been able to earn one-half the usual amount of wages for the last two or three months.—*Birmingham Iron Trade Circular.*

The Anglo-French Tunnel.

THE following lines from the columns of the London *Engineering* seem to be a very fair statement of the present condition of that important projected enterprise—namely, a tunnel across the Straits of Dover. They cannot but prove interesting to the larger portion of our readers:

"We last week showed how the proposition for effecting a permanent communication between France and England had passed beyond the limits of a visionary scheme, and had been lifted into the position of a contemplated undertaking, the propriety of attempting which is being seriously argued. That an address signed by so many powerful and influential names has been presented to the Emperor of the French; that two of our leading engineers have advanced themselves as the advocates of the project; that in all probability the report of the French Commission will be supplemented by another from an English Committee—all these are facts which show that the work lacks neither patronage, nor energy, nor skill, to bring it to a successful issue, if nature has set up no insurmountable barrier. Mr. Hawkshaw was the first engineer to devote much time to the consideration of the project, and the only engineer who has gained as the result of a lengthened and costly survey, and a thorough exploration by means of borings, as certain a knowledge of the material through which the tunnel would have to be driven, as it is possible to obtain.

"The investigations, which were commenced at the beginning of 1866, extended along the proposed line of route, and in each of the observations, pieces of the sea-bed were punched out, in order that the nature of the material might be ascertained. By this means, the imperfect geological information previously available was superseded by a positive knowledge of the bottom of the channel, and the position of the strata developed by the deep land borings at St. Margaret's Bay and near Calais was found to extend without fault from coast to coast, while the existence of any fissure in the sea-bed would scarcely reach to so great a depth below the surface, as is contemplated for the level of the tunnel, which it is tolerably certain would be cut for its entire length in the lower chalk, a material easy of working, and free of water.

"Mr. Hawkshaw's conclusions deduced from his observations are as follows:

"'1st. That there is a reasonable prospect that the work can be accomplished, but that it would be improper to deny that it is attended with a certain amount of risk.

"'2d. That this risk is limited to one contingency—namely, the possibility of sea-water finding its way by some unforeseen fissure into the workings in quantity too great to be overcome. Apart from this risk, tunnelling in chalk is easy and rapid, and the execution of a tunnel of the length of the one under consideration is only a question of time and expense.

"'3d. There seems to be no reason to assume that the tunnel would cost more than ten millions sterling, or that it could not be completed in nine or ten years.

"'4th. The question of risk would be fully solved by sinking land-shafts on each coast, and driving the preliminary driftways. This portion of the work being safely accomplished, the remainder would be of an ordinary character.

"'5th. The possible loss would be measured by the cost of this preliminary work, which we estimate at one million and a half, and which could not exceed two millions, or say one-fifth of the whole cost of the tunnel.

"'6th. That this risk should be undertaken by the Government of France and England, if, after consideration, they deem the importance of the work and the probability of its completion sufficient to justify them in doing so.'

"The risk described in the second item of the report is avoided, so far as can be foreseen, by keeping the level of the tunnel some two hundred feet below the bed of the channel, a depth which may be fairly assumed as sufficient to avoid any fissures, while the existence of faults in the strata has been disproved; and, indeed, the process of slow disintegration, by which the channel was formed, is one unfavorable also to the existence of fissures of great depth.

"With drift-ways once constructed from coast to coast, the conclusion of the whole would be rendered easy, and its successful completion certain, while, in case of failure, the loss would be confined to the amount spent upon these preliminary works—a sum of £2,000,000. None better than the promoters of this scheme understand the vast uncertainties which surround it, the uncertainties of its success as an engineering work, and of its success as a financial undertaking. Both these grave questions, with all the host of minor considerations they involve, will be long and earnestly discussed before it is decided whether it would be prudent to run the risk of incurring a perpetual international tax of £100,000 a year, upon the prosecution of an international scheme.

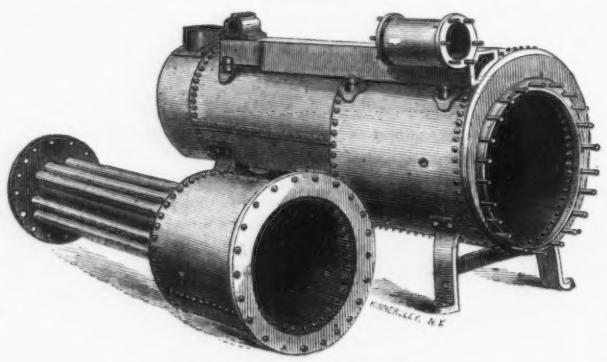
"But the contemplation of such a scheme by French and English statesmen proves that historical national prejudice is becoming extinct so rapidly and surely that antipathy, as powerful as that of the late Lord Palmerston, would have to succumb beneath its progress. Less than half the time than that set by the engineers as the limit for the completion of the tunnel, may, it is true, change for a season all political relations and all national feeling; but such a revolution, did it come, would only be a pause in the sure progress. And it is certain that whether the proposition stand or fall, whether it be entertained as worthy of Government help, or dismissed as unwise and impolitic, an improved international communication will be speedily accomplished. There will be an end at last to the miserable facilities which have so long disgraced us, and we shall have a means of transit worthy of the two countries."

Locomotive-Boiler with Removable Firebox and Tubes.

THE great and, in fact, only consideration, in the choice of a steam-boiler, is economy. This economy may be subdivided, so to speak, into three kinds: First, reliability or safety; second, fuel; and third, labor in taking care of it. The first kind of economy needs no explanation. Nobody will question for a moment the statement that a boiler that explodes is not economical, but, on the contrary, exceedingly expensive; and that not to speak of the danger to life and limb incurred in its use. But this latter point, however, among certain parties, appears to be a secondary consideration, they looking at the matter only from a monetary point of view. The second kind of economy, that of fuel, is of much more importance. It has to do with something more than the first cost of construction, as it is continually repeating itself; and, indeed, it is now generally conceded that a boiler, rather expensive in the beginning, but which effects a comparatively small saving of coal, is in the end cheaper than a less expensive one, that consumes daily a somewhat larger amount of coal.

The third kind of economy—to wit, the saving of labor in attending to the boiler—becomes important, when impure water has to be used, rendering an occasional cleaning thereby necessary. Those boilers, the construction of which is such as to admit of a thorough cleaning in an easy manner, are, of course, the most economical in this respect.

We believe that the boiler represented in the accompanying illustration fulfils, to a great extent, the above conditions. It possesses no irregular curves or unbraced flat surfaces, but is everywhere of cylindrical form, which is the safest form for resisting pressure. It is here represented with the fire-box and tubes removed, and laying at its side. The cut shows how, by merely unscrewing a set of nuts from the front and rear ends of the boiler, the whole of the fire-box, fire sheet, and tubes may be withdrawn. In case any incrustation on



LOCOMOTIVE-BOILER.

the tubes or interior surface of boiler has taken place, it may be easily removed; after which the tubes and fire-box are replaced and firmly fixed by means of the nuts, which, through the intervention of copper-packing, hold every thing together in a very compact manner.

The great objection to tubular boilers, heretofore existing—namely, impossibility of entering them for the purpose of removing incrustations, which is sometimes absolutely necessary—is by means of this invention entirely removed. It is needless to refer to the injury done to the boiler, and great danger existing, when using a boiler while incrustated. The fact is well known to all interested, and has been often enough discussed in papers, books, and lyceums. It is pleasing to know that, already, more than one thousand of these boilers are in use, and have given perfect satisfaction, and that, in point alike of safety, consumption of fuel, and facility of cleaning. They are manufactured at the works of the Steam Engine Co., Watertown, N. Y.

The Verpilleux Pump, for the Raising of Water to any Height.

As an emendation to our first article upon this interesting topic, the following considerations may not be without interest and value to our readers. The letters used refer, of course, to the cut that accompanied that article, which may be found on the initial page of our last issue.

In that description of the pump, the most essential part, that which causes it to raise the water to any desired height—namely, the weight—has only been mentioned, without the necessary amount of it for each particular case having been stated. It is clear that when this weight is small, the pump will raise the water only slightly above the limit of the effective action of atmospheric pressure—that is, thirty feet. If we wish to raise it say to sixty feet, this weight p must be over 15 lbs. for every square inch of the surface of the piston c. Suppose this piston to be six inches in diameter, or to have 28.27 square inches of surface, then the minimum weight must be 428 lbs., or better, 650 lbs., to secure its operation.

In general, the minimum amount of this weight must be one half a pound for every square inch of the surface of the piston, and for every foot in height, above thirty, that the pump is to raise the water. Calling the height at which the water is to be raised h, and the diameter of this piston c, the minimum amount of the weight p, required to make the pump do its required work, will be expressed by the formula:

$$p = 0.785\ c^2 \times \tfrac{1}{2}\ (h - 30.)$$

If h is less than 30, p necessarily becomes $= 0$. The necessary amount of weight for the safety-valve S must, for every square inch of its surface, surpass that of the weight p, the latter being attached to the piston c.

It is clear that the upward traction of the piston a is easier in proportion as the weight p is heavier, and that it never can be more than the weight of a column of water thirty feet high, and may be brought to require no power at all. It may, indeed, move upward of its own accord, as it were, if the weight p is heavy enough. The downward motion, however, has to raise only this weight, as the ascending and descending water-columns in E and B balance each other. We have now only to remark: First, that the safety-valve S becomes necessary only when, by carelessly filling the tube B by means of the stop-cock K, too large an amount of water is confined there; secondly, that the weight on this valve per square inch must be a little more than that on the piston c; and, thirdly, that the tubes E and B are, in the figure, placed at an oblique angle, for the sake of explanation of the operation, but in practice are usually placed in a vertical position, so that the pump may be used conveniently in the case of ordinary wells.

Iron and Steel Institute.

ON June 24th, at the rooms of the Society of Art, London, the first meeting of the newly-formed Iron and Steel Institute, which was very fully attended by ironmasters from the North, Lancashire, South Staffordshire, South Wales, Middlesborough, etc., was held under the presidency of his Grace the Duke of Devonshire, the President, who delivered a lengthy and exhaustive inaugural address. His Grace explained the objects of the Institute, which are to afford a means of communication between members of the iron and steel trades upon matters bearing upon the respective manufactures, excluding all questions connected with wages and trade regulations, and to arrange periodical meetings for the purpose of discussing practical and scientific subjects bearing upon the manufacture and working of iron and steel. He reviewed the success which had attended the formation of scientific and agricultural societies, and saw no reason why equal advantages should not accrue to the iron trade by association. Then his Grace passed on to review the early history of iron, the manufacture of which was mentioned by Homer and Hesiod, and had been asserted by Mr. Layard to have been known in Assyria in 900 B.C. He then noticed the early methods of manufacture down to the period of the use of coal, which gave such a vast impetus to the manufacture of iron in this country, and afterward referred to the invention of the "hot blast," the increased supplies of ore, and other causes which had contributed to the present importance of the iron manufacture. The processes by which pig iron, malleable iron, and steel are manufactured having been alluded to, the president referred to the utilization of the waste of gases from the blast furnaces, and went on then to show how the raw material and manufacture were distributed over the world. The problems now to be solved which were of the most importance were economy in the consumption of fuel and a greater utilization of the waste gases. Mineral oil had been used in the dockyards in place of coal. It was also highly important to obtain the metal as pure as possible, and though chemistry had been brought to the aid of the manufacture, yet the chemistry of iron and steel was still in many respects obscure and uncertain.

Diamonds.

DIAMONDS were first discovered in Brazil, in 1729, by a Portuguese, Fonseca Lobo, who was not even aware of the importance of his discovery until certain Dutch traders, to whom he showed his pebbles, at once contracted with the Portuguese Government for the monopoly of all the raw diamonds they might find in Brazil. From this contract they derived enormous profits. The territory in which this precious article is found is forty-four miles in length by twenty-two miles in breadth; it is called Terro de Fio, and is surrounded by steep mountains which long concealed it from the Europeans. Since the mines have again become the property of the State of Brazil, the Dutch have not quite lost their monopoly, they being extremely skilful in the art of cutti ng diamonds, and being possessed of all the requisite machinery for the pur pose. The operation causes the stone to lose half its weight, and is performed by means of wheels which make 2500 revolutions per minute.

Progress of the Hoosac Tunnel.

WORK on the central shaft over the Hoosac Tunnel, where the fatal accident happened two years ago, is now progressing at a rate of a foot a day. It has now reached a depth of 705 feet. New air drills are being set up, which expedite the work, so that it is expected that the whole depth, 1000 feet, will be excavated by March next. At the eastern end of the tunnel they are putting up six of the improved compressed air-drills. The heading at the western end is one mile and 200 feet from the entrance. Gangs of miners are constantly at work on the headings, while others are carrying out the enlargement, 150 feet of which is made. Three hundred and sixty-six feet have been taken from the heading since the 1st of April. The rock is being penetrated at the rate of from 40 to 50 feet per week. At each blast that is made on the enlargement 20 cubic yards of rock are displaced. At this rate of progression the tunnel can be completed in three years.

THE ENGINEERING AND MINING JOURNAL.

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PUBLISHERS' ANNOUNCEMENT.

THE ENGINEERING AND MINING JOURNAL *is projected in the intent of furthering the best interests of the Engineering and Mining public, by giving wide circulation to original special contributions from the pens of the ablest men in the professions. The careful illustration of new machinery and engineering structures, together with a summary of mining news and market reports, will form a prominent feature of the publication.*

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JOHN F. RICH *is our Agent for New-England. Office,* 13 *Boylston Place, Boston.*

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WESTERN & COMPANY,
Publishers and Proprietors,
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P. O. Box 5969. New-York City.

The Swiss a Nation of Inventors.

THE utility of protecting inventions by means of patents, has lately been questioned in Prussia and in England. The patent system in the last named country is so very defective that it is not surprising that the most intelligent are becoming disgusted with it; but still it is defended by many, however much a reform is needed. Among the defenders is the London *Engineering*, a scientific weekly, very ably conducted, when compared with certain American scientific journals, but apt to yield to the prejudices of patentees. This journal says: "In the United States patents are granted for seventeen years, for a single payment of £7. Every specification is carefully examined by experts previous to granting the patent. The consequence is, that about four times as many patents are applied for, yearly, as are patented in England, and that no nation has derived so great benefits from useful inventions as the American. In *Switzerland there is no patent law, and practically no inventions. Nobody, we think, ever heard of an invention coming from Switzerland,* unless, as is the case of Bodmer and Heilman, the inventor came with it."

The above from the *Engineering* is reproduced by our contemporary, the *Scientific American*, and that with the express remark that "it needs no comment." But we think it needs comment, and that very much. That an American patent agency concern not only reprints such absurdities, but countenances them by the remark that "it needs no comment," proves a surprising deficiency of needful information on their part. To say that nobody ever heard of a Swiss invention is as insulting to a nation where general education is very far in advance of that in England, as it is untrue. Not only the general education of the lower classes, but also of the higher, is so superior that many English youths from the first families are sent there to finish their studies. The first educator of the world, Pestalozzi, the man who taught us how to cultivate the mind properly, so as to prepare men to become inventors, should opportunity present itself, was a Swiss. The industrial schools of which we are just now beginning to talk about earnestly in this country, the excursions of students, during vacation, to centres of mining, manufacturing, etc., were in operation in Switzerland nearly or quite a century ago. How could a nation situated in the heart of Europe, absolutely without seacoast, and, indeed, almost without any navigable outlet, compete in its industrial products with the whole of Europe, not alone, but take the lead in many branches—we repeat, how could such a nation exist if it was not almost entirely a nation of inventors? Think for a moment of her manufactured products — the watches and music-boxes from Geneva, the embroideries from St. Gall, the Swiss muslins, cutlery, cheese, etc. The Swiss spun cotton with machinery almost a century ago, probably before it was done in England. They compete in cotton goods with England and the United States, and also in iron manufactures, notwithstanding they have no coal-mines, and are, to a great extent, compelled to use peat for metallurgical purposes. Fell's railway system is a Swiss invention, and their railroad-coaches surpass, perhaps, those of any other nation in the world in point of elegance and convenience. Hipp, the celebrated electrician, who is still living, constructed an electric weaving-machine, before Bonelli thought of it, and also, years ago, an electric piano. Electric clocks were first made in Switzerland, and at present very common in Swiss cities; while here it is still such a novelty that patents have only just begun to be taken out for modifications of their construction. Prof. Brunner invented a method of producing the metal manganese on a large scale, and obtained a medal for his discovery in the first Paris Exhibition. In regard to public works, the Freiburg wire suspension bridge, the first of its kind in the world, stands foremost, and they have also colossal church-organs in different cities, for the details of which a Yankee organ-builder would have taken out a dozen patents. The Swiss government is so alive in pushing ahead public works that the anticipated and now certain success of the Mont Cenis tunnel has determined the beginning of the St. Gothard tunnel, which will surpass in magnitude that of Mont Cenis, to the same degree, almost, that Mont Cenis surpasses all others.

To take Switzerland as an illustration of the usefulness of patent laws, is a very unfortunate argument, to say the least; it rather proves the contrary. The true inventive genius of a nation must not be measured by the quantity of their patents, but by their quality, and, better still, by the flourishing condition of their practical establishments, regardless of patents. How many United States patents are mere trash—not worth the paper they are written upon! Lower the cost of taking out patents, and make it, say, five dollars instead of thirty-five, and the number of applications for worthless trifles would soon amount weekly to as many thousands as it now does hundreds. The instances given above of the success of Swiss practical inventive genius and enterprise, without the protection of any home patent law, are only some instances which happen at the moment to come to mind. They might be largely augmented were it necessary. Enough, we believe, has been said to show clearly that no such imputation as the above can, with even a shadow of right, be cast upon the Swiss as an inventive people.

The Thompson Galvanometer.

THIS instrument is now being used as the receiving one for messages passed through the Atlantic cables, and as many imperfect accounts of its principle have appeared, the following sketch may serve to elucidate the subject.

The Thompson Marine Galvanometer is the invention or improvement of the noted electrician, Sir William Thompson, whose name has been so intimately associated with submarine telegraphy. The instrument is, in fact, a highly sensitive galvanometer, originally designed, we believe, for telegraphic testing purposes at sea as well as on land.

A helix of varied dimensions, of very fine silk-covered and otherwise insulated copper wire, around a small tube, encloses a delicate triangular-shaped permanent steel magnet, either highly polished or carrying with it a mirror. The magnet is suspended, freely to oscillate, by a minute thread of the finest unspun silk, to prevent tension. The mirror magnet, or mirror and magnet, is thus suspended in the heart of the coil of wire, so that, if a current passes through the coil, by electro-magnetic law the magnet will be deflected to right or left, according to the direction of the current. But to move the magnet, the effect of the earth's polarity will have to be neutralized, which would impair the sensitiveness of the instrument. The needle would have to be *astatified:* this is generally effected by placing in juxtaposition with the magnet another one, so that its relation would be reversed—the North pole of one opposite to the South pole of the other. As this is an inconvenient method of astatifying the needles, we believe that Professor Thompson neutralizes the polarity of his little magnet by means of the proximity of a powerful magnet, thus gaining the same object.

On account of the minute motions of so diminutive a magnet as that employed (weighing but a grain or two), an indicator which would be capable of exaggerating such motions would be desirable. Such is provided by the application of a beautilul optical principle—the simple one of reflection: an incident ray is impinged upon the tiny magnet by a lamp, contiguous to it, and the reflected ray of any required length is received on a graduated disc. Thus a little spot of light travels backward and forward, exhibiting the most infinitesimal vibrations that affect the magnet. Excessive oscillation is prevented in this instrument. Not having personally inspected the instrument, as recently manufactured by Mr. Farmer, of this city, and forwarded to the cable terminal at Duxbury, we cannot vouch the exactness of the above description, but in it the principles are noted.

Western Wit.

AT a burlesque celebration of the Fourth of July, last year, in Austin, Nevada, among many funny things, the following are worthy of perpetuation. The first is a portion of the "Declaration of Superintendents," the reading of which must have struck the audience as considerably less hackneyed than the usual "When, in the course of human events," etc. The "Declaration of Superintendents" was read by the Hon. Brazen Blowit, as follows:

Whereas, All men are created free and equal, or at least as nearly so as circumstances would permit—it being obvious that no red-haired man is responsible for his calamity—and any one man has a right to work as hard and get as much for his labor as any other man; and if a third should stand in, he ought to have a fair deal and as good a show as the first man. And *whereas,* It sometimes becomes necessary for men to labor in order to get money enough to celebrate the Fourth of July, and support themselves and maintain their families, until they are able to maintain themselves by taking in washing or by any other form of agriculture. And *whereas,* Lander Hill contains millions upon millions of dollars, and there is no probability that the exact number of millions ever will be accurately ascertained. And *whereas,* Owing to the peculiar conformation of the superincumbent and directly adjacent masses of rock which surround the veins and their questionable igneous origin, as shown by frequent dislocation and felspathic predomination, and therefore the great difficulties which arise in following infiltrated insignificance in massive abomination. And *whereas,* While a great many mines have been sunk by men, a great many more men have been sunk by mines; *Therefore,* we, the Superintendents of mines of the Reese River country, have caused it to be *resolved,*

1st. That Lander Hill contains more ore in less spots, and less ore in more spots, than any other hill in the United States.

2d. That there are no telescopes now in existence by means of which a man can see one hundred feet ahead of himself in solid rock, always excepting those in the possession of prospectors in new districts. . . .

Equally amusing is the poem read by the Grand Dervish, or chaplain of the occasion, and announced to be "addressed to infant minds, and adapted to the capacity of this audience." The Dervish "lined off" a number of the verses, and they were sung by the congregation to the tune, "There were three crows sat on a tree."

There was a mine in Lander Hill,
If not dug out it's up there still.
Into this mine a man went down,
A man who came from Boston town;
And when this man came up again
His back and legs were racked with pain,
But in his hands some rock he bore,
And hastened to the Assayore:
"Pray tell me how much does it run?"
"Ten thousand dollars to the ton."
So back he hied and bought that claim,
And built a mill to work the same;
The mill was large and wondrous fine,
But there was no work done on the mine.
"Who cares a rip," this man he cried;
"We'll work out first the rich chloride."
He worked it dry, he worked it wet,
But nary silver did he get.
And next he told another story—
The ore was blasted refractory;
But by his patent new process
He'd cure it of its cussedness.
At length the real truth came out—
Both man and mine had petered out.

MORAL.

My friends, unless you want a fizz,
Don't mine, until you know the biz.

A Strong Cement.

A GOOD, strong cement, which may be used for a great number of purposes in the arts, may be made as follows: Take three parts of fine, clean sand, two parts of litharge, and three of plaster-of-paris. Mix them well together in the form of a dry powder, and then make into a stiff paste, with good boiled oil. A heavy, sticky mass is thus produced which has powerful adhesive properties, and in a very short time sets into an exceedingly hard mass. It is admirably adapted as a sort of hydraulic putty, as it will adhere to stone, glass, iron, wood, etc., and will stop all cracks and leaks. So too for repairing fractures in stone or iron, and for the restoration of pieces of sculpture, nothing can be better.

The Late Railway Accident.

THE New-York *Times* expresses the belief that the late, and indeed many railway accidents, might be avoided by adopting the European system of coupling, whereby a train is made one body, and to abandon the slack coupling at present adopted. Without commenting on the above, we would suggest with emphasis the adoption of the European system of continued supervision of the permanent way, by dividing the line of railway into sections, each under constant inspection.

Real Estate at White Pine.

DOWN on Chloride Flat, says a White Pine paper, there is a miner's cabin built out of chunks of high grade chloride ore, estimated at $2000 a ton. The house is sixteen feet square, and the rock in its walls, if crushed, would yield about $75,000. The house is for sale.

THE Honolulu *Gazette* reports the discovery of what is described as a valuable fire-proof, hydraulic cement. It is formed of volcanic ash from the volcanoes of Molokai, and the Hawaiians expect to find in it a new and important source of commerce. Probably a puzzolano, as obtained from volcanic remains in Italy, and used by the ancients as a hydraulic cement also by Smeaton.

ON the point of going to press we have received the painful intelligence of the death of John A. Roebling, the distinguished engineer, known to the world as the hero of the "Niagara Railway Suspension-Bridge." We reserve a notice of deceased until our next issue.

MARKET REVIEW.

The Coal Trade.

NEW-YORK, July 23d, 1869.

THERE is more demand for coal, with less stability as regards prices. Our present quotations are nominal. The production of the various mines thus far is about 450,000 tons less than that of last year; but, now that the strike is over, there is a rapid increase as compared with the corresponding week last year.

The Philadelphia *North American*, July 17th, says:

"The disposition is daily growing stronger to procure large shipments at once.

"The Lehigh and Schuylkill regions are actively at work, but suspension is still the order of the day with the Delaware & Hudson and the Delaware, Lackawanna & Western Companies, and they positively declare they will never accept the 'basis.' As most of their miners have obtained employment elsewhere, we can see no prospect of a speedy resumption in that locality.

"This is materially curtailing the production, and will, in all probability, cause a short supply, unless the present estimates of the year's consumption are very much at fault. The carrying companies cannot transport more coal during the balance of the season than will, in all probability, be required, and so it is not likely that the present rates will recede, while there is every prospect of a still further advance."

We cull from our exchanges in the coal districts the following items of news relative to the progress of events affecting the trade:

Says the Wilkesbarre *Record of the Times*: "With an occasional hitch, as there always must be in the working of new machinery, the coal trade has increased the past week until there is pretty general complaint of scarcity of means of transportation. Cars are scarce. The Morris & Essex rolling-stock is added to the old supply, but still there is a deficiency."

It is said that the Lehigh Coal & Navigation Company has purchased the coal property of the Lehigh-Luzerne Coal Company, at Nanticoke, Luzerne County. Prominent among the members of the Lehigh-Luzerne Company were Messrs. John Leisenring, of Mauch Chunk, and Charles Parrish, of Wilkesbarre. The latter company is reported to have cleared about $250,000 by the sale.—*Exchange.*

We should like to be able to state all the facts about this sale. Report says the L. C. & N. Co. was badly burned.

We learn that, at a meeting of the Carbondale miners, on Saturday evening last, it was resolved not to resume work in the mines there in ten years, unless the Delaware & Hudson Coal Company complied with their demand for a basis. The company will never, to all appearances, comply with the demands of the basisers, so there the matter rests. Meanwhile, Europe and Asia are hammering for admittance to the mines.—*Scranton Journal.*

The Delaware & Hudson Canal Company have discharged fifty more men from their docks at Rondout, and it is rumored that, if the strike continues, work will be discontinued altogether. We see it stated that a force of nearly 2000 men from the striking miners are now employed in building the new railroad from Carbondale to Lanesboro.—*Honesdale Herald.*

The following table exhibits the quantity of Coal passing over the following routes of transportation for the week ending July 17th, 1869:

COMPANIES.	1868. WEEK.	1868. TOTAL.	1869. WEEK.	1869. TOTAL.
Phila. & Read. R. R.	10,078	1,674,440	109,122	1,633,423
Schuylkill Canal,...	6,341	477,677	30,240	281,366
Lehigh Valley R. R.	11,871	1,299,047	60,588	1,123,531
Lehigh & Sus. R. R.	10,472	398,510	43,200	535,106
Lehigh Canal,.....	7,329	386,685	36,072	239,237
Scranton North,....	13,926	254,691		205,857
" South,....	19,173	565,371		587,631
Penn. Coal Co., rail,	22,335	463,466	23,532	516,548
" " " canal,	1,168	12,622	360	8,204
Del. & Hudson Rail,				
" " " canal,				
Shamokin,.....	9,382	251,503	11,262	177,346
Trevorton,.....	363	10,032	826	9,448
Short Mountain,...	1,675	51,775	1,793	51,106
Lykens Val.,Can.Co.	834	43,918	1,820	33,103
Hunt'g'n & B'd Top,	5,978	125,075	9,096	188,626
Wyoming South,....	8,199	102,536	13,454	83,955
" North,....				
Williamstown, Col'y	1,830	91,011	6,792	89,730
Total, ...	130,924	6,308,359	348,157	5,764,227
1869,.....		5,764,227		
Decrease,.....		444,132		

Lehigh Canal Coal Trade.

Shipped for the Week Ending July 17, 1869.

WHERE FROM.	WEEK. Tons. Cwt	TOTAL. Tons. Cwt.
Total M. Chunk Region,.....	10,963 06	67,721 15
" B. Meadow "	5,808 17	34,875 18
" Mahanoy "	96 04	1,070 17
" Hazleton "	9,704 05	62,709 16
" Upper Lehigh "	187 10	2,468 00
" Wyoming "	9,312 11	70,391 06
Grand Total,.....	36,072 13	239,237 12
Corresponding week last year,	7,329 11	386,685 17
Increase,.....	28,743 02	
Decrease,.....		147,448 05

Report of Coal Transported over Lehigh Valley Railroad

For the week ending July 17, 1869, and previously this season, compared with the same time last year:

WHERE SHIPPED FROM.	WEEK. Tons. Cwt	PREVIOUSLY Tons. Cwt.	TOTAL. Tons. Cwt.
Total Mahanoy,...	15,590 02	167,006 04	182,596 06
" B. Meadow,.	12,802 08	190,616 06	203,418 14
" M. Chunk,..		124 04	124 04
" U. Lehigh,..	174 10	7,736 03	7,910 13
" Hazelton,....	22,632 09	525,711 05	548,343 14
" Wyoming,..	10,514 18	207,396 11	217,911 09
Total,.....	61,714 07	1,098,590 13	1,160,305 00
To L. & S. R. R., at P'n Hav. for rail,		4,174 00	4,174 00
Do. for canal,.....	9,687 15	57,023 01	66,710 16
At Mauch Chunk for Canal, ...	5,905 01	31,947 08	37,852 02
Total Anthracite,...	77,307 03	1,191,734 05	1,269,041 18
Susquehanna Region Bit. Coal (Fall Creek).....		552 03	552 03
71. by rail & canal,	77,307 03	1,192,286 18	1,269,594 01
Same time last y'r,	15,520 06	1,380,195 06	1,395,715 12
Increase,.....	61,786 17		
Decrease,.....		187,908 08	126,121 11
Forw'd east from M. C'k by rail, ..	60,588 15	1,062,942 09	1,123,531 04
Same time last y'r,	11,871 16	1,287,175 19	1,299,047 15
Increase,.....	48,716 19		224,233 10
Decrease,.....			175,516 11

RECAPITULATION:

Forw'd east from M. C'k by rail,...	60,588 15	1,062,942 09	1,123,531 04
Del. at M. Chunk,.	11 06	620 19	632 05
Del. on line of r'd above M. Chunk,	160 04	5,279 10	5,439 14
Del. ab. M. C. for use of L.V.R.R.,	755 10	25,191 08	25,946 18
To N. C. R. R., at Mt. Carmel,.....		2,516 09	2,516 09
To L. & S. R. R., at P'n Hav., for r'l.		4,174 00	4,174 00
Do. for canal, ...	9,687 15	57,023 01	66,710 16
Do. Packerton for rail,.....	198 12	2,592 01	2,790 13
At Mauch Chunk for canal,.....	5,905 01	31,947 01	37,852 02
Total,.....	77,307 03	1,192,286 18	1,269,594 01

Lehigh and Susquehanna Railroad.

Report of Coal Shipped for the Week ending July 17, 1869.

WHERE FROM. WYOMING REGION.	WEEK. Tons. Cwt	TOTAL. Tons. Cwt.
Total M. Chunk Region,.....	4,409 03	72,580 10
" Hazelton "	9,832 14	64,437 01
" Upper Lehigh "	3,151 04	62,582 15
" Wyoming "	25,807 05	335,505 12
Grand Total,.....	43,200 06	535,106 01
Corresponding week last year,..	10,472 13	398,510 12
Increase,.....	32,727 13	136,595 09
Decrease,.....		
Forwarded South from Mauch Chunk,.....	23,331 19	365,738 09
Delivered on line of L. & S. R. R., above Mauch Chunk,...	813 18	17,364 03
Delivered to Lack. & Bloom. R. R., at Plymouth Bridge, ...		13,688 06
Delivered to L. V. R. R. Co., at Sugar Notch,.....		5,151 03
Delivered at Coal Port, for Shipment by Canal,.....	19,054 09	133,164 00
Total,.....	43,200 06	535,106 01

Schuylkill Coal Trade.

By railroad and canal for the week ending Thursday, July 15, 1869.

PLACES.	RAILROAD.	CANAL.
St. Clair, ...	36,356	
Port Carbon,.....	9,327	10,813
Pottsville,.....	5,423	2,202
Schuylkill Haven,..	34,724	16,158
Auburn,.....	3,146	
Port Clinton,..	16,141	1,067
Total paying freight, ..	105,117	
Coal for Company's use,...	4,005	
Total for week..	109,122	30,240
Previously this year,.....	1,524,311	251,095
Total, ...	1,633,433	281,336
To same time last year,....	1,674,140	477,677
Increase,.....		
Decrease,.....	41,007	196,341

The Cumberland Coal Trade.

B. & O. RAILROAD.

The shipments over the Baltimore and Ohio Railroad for the week ending July 17, 1869, were as follows:

From Cumberland and Pa. R. R.	
Consolidation Company,.....	3,178.02
Borden "	1,705.07
Balt. & Hampshire "	885.07
Midlothian "	1,009.03
Alleghany "	88.06
From Eckhart R. R.	
C. C. and I. Co.....	2,767.18
From George's Creek via Piedmont.	
George's C. C. & I. Company,.....	2,760.18
Central "	2,979.16
Atlantic "	2,110.12
Piedmont "	2,072.18
Swanton "	1,412.17
American "	2,477.16
Potomac "	1,934.19
Franklin "	2,307.14
Hampshire "	2,800.15
Total,.....	30,691.18

BY C. & O. CANAL.

For the week ending July 17th, 1869, the shipments by the Chesapeake and Ohio Canal were as follows:

American Company,.....	4,946.19
Borden "	2,068.01
Central "	4,527.07
C. C. & I. Co. "	2,254.03
Consolidation "	3,492.04
George's Creek"	654.08
Hamp. and Bal."	1,624.04
Midlothian "	765.16
James Boyce,.....	440.12
Total for week,.....	20,773.14

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

	AT NEW-YORK, July 15th.		AT PHILADELPHIA, July 15th.	
SCHUYLKILL.	R. A.	W. A.	R. A.	W. A.
Lump.	$....	$7 50	7 00	6 75
Steamer,.....	....	7 75	7 00	6 75
Broken,.....	....	7 75	7 00	6 75
Egg,.....	....	7 75	7 00	6 75
Stove,.....	....	8 00	7 00	6 75
Chestnut,.....	....	7 00	6 00	5 75
Pea,.....	....	....	....	....
LEHIGH.				
Lump,.....	....	....	7 00	....
Steamer,.....	....	....	7 00	....
Broken,.....	....	....	7 00	....
Egg,.....	....	....	7 00	....
Stove,.....	....	....	7 25	....
Chestnut,.....	....	....	6 50	....
Pea,.....	....	....	4 75	....
SPECIAL COALS.*				
Diamond Vein,....	R. A.	8 25	....	.. ..
New-England,.....	"	....	....	....
Locust Dale,.....	W. A.	8 00	....	....
Honey Brook, Le'h	"	7 50	....	....
Harleigh,	"	7 50	....	....
Spring Mount'n	"	7 50	....	....
Sugar Creek,...	"	7 50	....	....
Sugar Loaf,.....	"	7 50	....	....
Fulton,.....	"	7 50	....	....
Stout,.....	"	7 50	....	....
Old Comp'y's...	"	....	....	....
Cross Creek,....	"	7 50	....	....
Chauncey,.....	"	....	....	....
Girardville,.....	"	....	....	....
McMichael,.. ..	"	....	....	....
Duncan,.....	"	....	7 00	7 50
Shamokin,.....	"	7 00	7 00	6 75
Lykens Valley,..	"	7 25	....	7 25
Broad Top,.....	"	....	....	5 25
Hill & Harris,..	"	7 00	....	6 75
Henry Clay,....	"	7 00	....	7 00
Powelton,.....	"	....	....	6 75
Burnside,.....	" R. A.	....	....	7 50

[* Dealers in these coals may be found in our advertising columns.]

Prices of Coal by the Cargo.—Continued.

Kittaning Coal Co.'s Phœnix Vein,..f. o. b.	$5 50
Lemon " " "	5 25

COMPANY COALS.

	L.	Str.	Gra.	Eg.	Sto.	Cst.
Scranton at E. Port,	..	..	..	..	..	..
Pittston at Newb'g,	..	..	..	..	..	..
Lacka'na at Rond't,	7 25	7 25	7 25	7 25	7 50	6 10
Wilk'b're at Hob'kn,	..	7 25	7 25	7 25	7 50	7 00

For freights to different points, see "Freights."

Prices at Baltimore, June, 1869.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load,.....	$6 75	7 00
Pittston and Plymouth,.....	6 50	6 75
Shamokin R., or W. Ash,.....	6 50	6 75
Lykens Valley, R. A.,.....		7 00
Trevorton, R. A.,.....	6 50	6 75
By retail, per ton of 2240 lbs. delivered,...	8 00	8 50
Georges Creek & Cumberland f. o. b. at Locust Point for shipping,.....		5 00
West Fairmount Gas, f. o. b.,.....		6 00

Prices at Georgetown, D. C., & Alexandria, Va.

July, 1869.

George's Creek & Cumberland f. o. b. for shipping,.....	$4 75

Prices at Havre de Grace, Md.

July, 1869.

Wilkesb're & other White Ash for cargoes,	$6 75	7 00
Lykens Valley,.....	7 00	7 25
Shamokin R. or W. Ash,.....	6 75	7 25
Trevorton and Zerba Valley,.....	6 50	7 00

Prices for Coal at Mauch Chunk.

	L.	Str.	Gra.	Eg.	Sto.	Cst.
Lehigh,.....						
Wilkesbarre, ..$4 00	$4 50	$4 50	$4 50	$4 50	$4 00	

Freight to Elizabethport, $2.38; to New-York, $2.35.

Prices of Foreign Coals.

June.

Duty, $1.25 per ton.

Corrected weekly by PARMELEE BROS., 32 Pine-street, New-York.

Liverpool Gas Caking,.....	$ 9 50	
" " Cannel,.....	14 00	
" House "	18 00	19 00
" " Orrel,.....	16 00	18 00
Per ton 2240 lbs., Ex. Ship. PRICES FROM YARD.		
Liverpool House Orrel, screened,.....	$16 00	$18 00
" " Cannel, ...	18 00	20 00

Per ton 2000 lbs., delivered.

Prices of Gas Coals.

June, 1869.

PROVINCIAL.

Duty, $1.25.

	Coarse. Gold.	Slack. Gold.
Block House,.....	$1 75 @$	75
Gowrie,.....	1 75	75
Lingan,.....	1 75	75
Sydney,.....	2 13½	71½
Pictou,.....	2 13½	1 18½
Little Glace Bay,.....	1 50	1 00
Caledonia,.....	1 50	75

AMERICAN.

	Coarse. Currency.	Slack. Currency.
Westmoreland Co.,...	$8 75	
Despard Coal Co.,.....	8 50	8 00
Penn.....		
Newburg Orrel Gas,.....	8 50	8 00
West Fairmount Gas Coal,.....		8 00

AT PHILADELPHIA.

Powelton,.....	7 80

Freights.

July, 1869.

To Eastern Ports.	From Philadel'a.	From E. Port and Port Johnston.	From Newburg.	From Rondout.
Stamford,.....	..	$1 00	$1 25	$1 25
Norwalk,.....	...	1 00	1 25	....
Bridgeport,.....	....	1 15	1 25	1 25
New-Haven,.....	$1 80	1 00	1 25	1 25
Hartford,.....	....	1 10	....	1 65
New-London,.....	....	1 15	1 35	1 35
Norwich (and tow),....	1 85	1 25	1 45	1 45
Mystic,.....	....	....	1 40	....
Stonington,.....	..	....	1 40	1 35
Sag Harbor,.....	....	....	1 40	....
Bristol, ...	....	....	1 55	1 60
Newport,.....	....	1 40	1 55	1 60
Fall River,.....	....	1 40	1 55	1 60
Providence,.....	2 00	1 40	1 60	1 60
Dighton,.....	....	....	1 60	....
Warren,.....	....	....	1 60	....
Pawtucket,.....	....	....	1 75	1 75
New-Bedford,.....	2 00	1 40	..	1 75
Boston,.....	2 50	1 75	1 75	1 75
East Cambridge,.....	....	....	1 85	....
Salem,.....	2 50	1 75	1 75	1 75
Newburyport,.....	2 70	2 00	1 85	1 80
Portsmouth,.....	2 75	1 75	1 80	1 80
Rockport,.....	....	....	1 80	....
Saco,.....	2 85	1 75	1 80	1 75
Portland,.....	....	1 75	1 75	....
Bangor,.....	....	....	1 75	1 80
Bath,.....	2 50	....	1 80	....
Middletown,.....	....	....	....	....
Amesbury,.....	2 70	....	....	....
Boston,.....	2 50	....	....	....
Cambridgeport,.....	2 50	....	....	....
New-Bedford,.....	2 00	....	....	....
Taunton,.....	2 00	....	....	....
Derby,.....	2 00	....	....	....
New-York,.....1 35 @	1 40	....	....	....
Hackensack,.....	1 65	....	....	....
Jersey City,.....	1 35	....	....	....
To River Ports.				
Troy,.....	1 95	95	60	55
Albany,.....	1 90	90	55	50
Cooyman's,.....	1 50	....	55	50
Stuyvesant,.....	1 50	....	50	45
Coxsackie,.....	1 75	....	45	45
Hudson Railroad,.....	....	1 00	40	50
Catskill,.....	....	....	40	35
Poughkeepsie,.....	1 50	75	30	25
Fishkill,.....	1 55	....	20	30
Cold Spring,.....	1 75	70	30	50
Haverstraw,.....	1 50	50	45	50
Nyack,.....	1 45	50	55	50
Sing Sing,.....	1 56	....	60	50
Yonkers,.....	1 40	40	60	55
New-York,.....	1 40	50	60	65
Saugerties,.....	1 50	....	35	30
Rhinebeck,.....	1 50	....	30	35
Rondout,.....	1 60	60	30	25
Tarrytown,.....	1 75	80	....	....
West Point,.....	1 50	75	30	50

Rates of Transportation to Tide Water.

[BY RAILROAD.]

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven,.....	$2 00

From Port Carbon, 8 cents per ton more.

TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Easton,....	$1 04
C. R. R., N. J., Easton to Elizabethport,.....	1 54
	$2 58
Shipping Expenses at Elizabethport,.....	25
Total,.....	$2 83

Rates of Transportation.—Continued.

TO PORT JOHNSON.

L. V. R. R.,.....	$1 04
C. R. R. of N. J.,.....	1 63
Shipping Expenses,.....	25
Total,.....	$2 92

TO HOBOKEN.

L. V. R. R.,.....	$1 04
Morris & Essex R. R.,.....	1 63
Shipping Expenses,.....	25
Total,.....	$2 92

[BY CANAL.]

TO PHILADELPHIA.

From	Pt. C.	Potts.	S. H.	Pt. C.
Tolls,.....	$1 43	$1 42	$1 40	$1 04

TO NEW-YORK (Morris).

Lehigh Canal Tolls,.....	$ 54
Morris Canal Tolls,.....	60
Freight,.....	1 70
Towing,.....	10
Total,.....	$2 94

TO NEW-YORK (Delaware and Raritan).

Lehigh Canal Tolls,.....	$ 54
Delaware Division Tolls,.....	40
Delaware & Raritan Tolls,.....	47
Freight,.....	1 40
Towing from New-Brunswick,.....	20
Total,.....	$3 01

TO NEW-BRUNSWICK for Re-shipment.

Lehigh Canal Tolls,.....	$ 54
Delaware Division Tolls,.....	40
Delaware & Raritan,.....	47
Freight,.....	1 15
Shipping,.....	30
Total,.....	$2 86
Drawback,.....	10
	$2 76

Metals.

IRON.—Duty: Bars, 1 to 1¼ cents ℔ lb; Railroad, 70 cents ℔ 100 lbs.; Boiler and Plate, 1½ cents ℔ lb; Sheet, Band, Hoop, and Scroll, 1½ to 1¾ cents ℔ lb; Pig, $9 ℔ ton; Polished Sheet, 3 cents ℔ lb.

Pig, Scotch, No. 1, ℔ ton,.....	38,	@42 —
Pig, American, No. 1,.....	42 —	— —
Pig, American, No. 2,.....	38 —	39 —
Pig, American, Forge,.....	36 —	— —
Bar, Refined, English and American,.....	85 —	90 —
Bar, Swedes, assorted sizes (gold),.....	82 50	87 50
STORE PRICES.		
Bar, Swedes, ord'y sizes,....less 5 ℔ ct.,	— —	140 —
Bar, Refined,.....less 5 ℔ ct.,	90 —	92 50
Bar, Common,.....less 5 ℔ ct.,	85 —	87 50
Scroll,.....less 5 ℔ ct.,	120 —	150 —
Ovals and Half-round, ...less 5 ℔ ct.,	117 50	142 50
Band,.....less 5 ℔ ct.,	117 50	— —
Horse Shoe,.....less 5 ℔ ct.,	117 50	— —
Rods, ¼ to 3-16 inch,.....less 5 ℔ ct.,	97 50	155 —
Hoop,.....less 5 ℔ ct.,	125 —	180 —
Nail Rod, less 5 ℔ ct.,.....	8¼ —	9¾
Sheet, Russia, as to Nos. (gold),.....	— 10¼ —	12½
Sheet, Single, D. and T. Common,.....	— 5 —	7
Sheet, Galvanized,..... List 20 @ 25 ℔ cent dis.		
Rails, English (gold), ℔ ton,.....	— —	56 50
Rails, American, at Works in Pa.,..	— 74 —	76

STEEL.—Duty: Bars and ingots, valued at 7 cents ℔ lb or under, 2½ cents; over 7 cents and not above 11, 3 cents ℔ lb; over 11 cents, 2½ cents ℔ lb, and 10 ℔ cent ad val. (Store prices.)

English Cast (2d and 1st quality) ℔ lb,	— 18 @	— 22
English Spring (2d and 1st quality),...	— 9 @	— 11½
English Blister (2d and 1st quality),...	— 11½@	— 19
English Machinery,.....	— 12½@	— 15
English German (2d and 1st quality),..	— 14 @	— 16
American Blister, "Black Diamond," ..	— 10½@	— 16
American, Cast, Tool, " ..	— 19 @	— —
American, Spring, " ..	— 10 @	— 13
American Machinery, " ..	— — @	— 13
American German, " ..	— 10 @	— 13

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper cents ℔ lb; Manufactured, 45 per cent ad val.

	All Cash.
Copper, New Sheathing, ℔ lb,.....	— @ — 32
Copper Bolts,.....	— @ — 33
Copper Braziers, 16oz. and over,.....	33 @ — 35
Copper Nails,.....	38 @ — 40
Copper, Old Sheathing, etc., clean,.....	22½@ — 23¾
Copper, Chili Pig,.....	— @ — —
Copper, American Ingot,.....	22 @ — 22½
Yellow Metal, New Sheathing,.....	— @ — 27
Yellow Metal Bolts,.....	— @ — 27
Yellow Metal Nails,.....	— @ — 27

LEAD.—Duty: Pig, $2 ℔ 100 lbs.; old Lead, 1¼ cts. ℔ lb; Pipe and Sheet, 2½ cents ℔ lb.

Galena, ℔ 100 lbs,.....	— — @ — —
Spanish (gold),.....	$6 30 @ $6 35
German "	6 30 @ 6 50
English "	6 30 @ 6 87½
Bar,.....(less 6 ℔ cent).....	— — @ 10 50
Pipe and Sheet, "	— — @ — 12

TIN.—Duty: Pig, Bars, and Block, 15 ℔ cent. ad val.; Plate and Sheets and Terne Plates, 25 ℔ cent. ad val.

	Gold. ℔ lb.
Banca,.....	33½@ — —
Straits,.....	29½@ — 30
English,.....	29½@ — 30

Plates.

Fair to good brands,	Gold.	Currency.
I. C. Charcoal, ℔ box,..$8 —	@ $8 50	$11 25 @ $12 —
I. C. Coke,.....	6 75 @ 7 50	9 50 @ 10 75
Coke Terne,.....	5 75 @ 6 —	8 25 @ 8 50
Charcoal Terne,.....	7 75 @ 8 25	11 — @ 11 75

SPELTER.—Duty: In Pigs, Bars, and Plates, $1.50 ℔ 100 lb.

	Gold.
Plates, Foreign,.....℔ 100 lb.	$6 37½@ $6 40
Plates, Domestic,.....℔ lb.	11 @ 12

REMARKS.

IRON.—There is less inquiry for Scotch Pig. Dealers being well supplied by the recent purchases, have again withdrawn, and the market closes dull at $38 @ $42. The invoices recently received by steamer were sold and reported previously; 120 tons Eglinton sold at $39; 400 do. Glengarnock, part supposed $28 gold; and some small lots Gartsherrie, from yard, $41 currency. American has been offered a little more freely, and we notice sales of 100 tons No. 1, and 500 do. No. 2 ex Thomas, on terms not made public. Holders are still asking $42 for No. 1, and $38 @ $39 for No. 2. Wrought Scrap continues in moderate request, and sales have been made of 200 tons English, on private terms. New English Rails have advanced to $56.50 gold, with sales of 400 @ 500 tons at that figure; and 200 do. old, to arrive, $50 currency. Bar from store continues very quiet, and our quotations are rather nominal.

The amount of Pig Iron transported by the Lehigh Valley Railroad Company for the week ending July 17th, 1869, was as follows: From Carbon Iron Co., 55 tons; from Lehigh Valley Iron Co., 190 tons; from Thomas Iron Co., 700 tons; from Lehigh Crane Iron Co., 495 tons; from Allentown Iron Co., 430 tons; from Robert Iron Co., 125 tons; from Glendon Iron Co., 520 tons; from Bethlehem Iron Co., 460 tons; other shippers, 530 tons. Total, 3505 tons.

STEEL—Is quiet and steady at old quotations.

NITRATE SODA.—The cargo of 6000 bags, just arrived, was sold previously; we quote 4¼ @ 4¼c. gold, in lots.

REGULUS ANTIMONY.—Small lots sold at 12½c. gold.

COPPER continues quiet but steady. Sales of the week 500,000 lbs. at 21½c. to 22c. for Baltimore, and 22½c. for Lake Superior. The sales are in lots to manufacturers, and there is no disposition to speculate.

The London market is steady at £68 for Chili Bars.

TIN steady at 29½c. @ 30c. for Straits, 33½c. for Banca, and 20c. for English, all gold. The stock in first hands is withheld from the market, and the dealers are selling at the above rates.

The European markets are unsettled at 130 pt. for Straits in London, and fl. 78¼ @ 79.

SPELTER dull at $6.35 gold, for foreign.

LEAD steady at $6¼ @ $6½ gold, for ordinary foreign, with sales of 250 tons for the week.

ZINC.—We quote French Oxide Dry, 12c. @ 12½c.; American Dry, 8c. @ 8½c.; Metallic Dry, 12½c. Duty, 2½c. per pound.

Mining Stocks.

NEW-YORK, Ju'y 22d, 1869.

THE prices for many of the leading gold and silver stocks show, by the Exchange reports, a marked decline. For instance, Grass Valley, which sold last week at 60c., can now be bought at 35c., and Quartz Hill and Consolidated Gregory each show a decline since our last of about 10c.

The following is the list of quotations published by the Mining Board:

	Bid.	Asked
Consolidated Gregory	$1 45	1 55
Grass Valley	35	40
Gunnell Gold	—	50
Mariposa	6½	9
" pfd.	15½	16
Montana Gold	—	15
Quartz Hill	1 00	1 00
Smith & Parmelee Gold	2 05	—
N. Y. and Eldorado	—	1 00
Quicksilver	15½	16
Flint Steel River Copper	—	4 00
Wallkill Lead	5	—
Wallkill, assented	13	15
Cumberland Coal	31½	32
Lehigh and Susquehanna Coal	75	—
Bennehoff Coal	—	50
Brevoort	1 25	1 75
Buchanan Farm Petroleum	50	52
Central	60	65
Home Petroleum	6 00	7 00
Pithole Creek	—	2 00
Rynd Farm	15	—
United Petroleum Farms	16	20
United States	90	—

SAN FRANCISCO, CAL., July 19th, 1869.

Stocks.	Bid per ft.	Share
Gould & Curry	No sales.	
Savage (per share)	91	89½
Chollar Potosi	27½	27¾
Ophir	23	
Hale & Norcross	127	124
Crown Point	50	49
Yellow Jacket	54	52½
Belcher	26	25
Imperial (per share)	64	
Alpha (per share)	25¼	
Kentuck	170	167
Amador	290	

MISCELLANEOUS.

Portable Steam Engine & Manufacturing Co.
Manufacturers of Portable and Stationary
STEAM ENGINES,
FROM 3 TO 80 HORSE POWER,
Portable Circular Saw Mills, Car Wheels, Shafting, Etc., Etc.
WATERTOWN, N. Y.
For Descriptive Price-List with Cuts, address
July 27-tf I. P. POWERS, SEC'Y.

GEO. H. JOHNSON,
PHOTOGRAPHIC ARTIST,
1288 BROADWAY,
(LATE OF CALIFORNIA.) NEW-YORK.
July 27-tf

ED. SEARS'
Wood-Engraving Establishment.
Engraving, Designing, and Photographing on Wood, in all its branches, viz: Portraits, Fine Book Work, Machinery, Maps, Buildings, Illustrated Catalogues, Views, etc. N.B. Special attention given to Color Work of all descriptions. 48 BEEKMAN STREET, New-York.

PATENTS.
WILLIAM F. McNAMARA,
Counsellor at Law and Solicitor of Patents.
37 Park Row, New-York.
PATENTS PROCURED
on all improvements in Machinery, Chemical Processes, Compositions, etc. Mining inventions will receive very careful attention. Advice as to the manner of proceeding given free by writing for it. Assignments, Licenses, and Agreements relating to Patents drawn with care. An experience of five years has enabled me to become very familiar with all the requirements of the Patent law, and the working of the Patent Office.
Refer to MESSRS. WESTERN & CO.
March 27-tf.

The Earth-Closet Company
OFFICE:
209 State Street, Hartford, Conn.
SALESROOMS:
597 Broadway, New-York.
513 Market Street, Philadelphia.
19 Doane Street, Boston.
Send for Circulars containing full information and for working drawings, to the Hartford Office.
ALSO FOR SALE
PREPARED DRY EARTH FOR DRESSING WOUNDS AND SORES.
July 20

COAL SHIPPERS.

POWELTON COAL AND IRON CO.,
SOLE MINERS AND SHIPPERS
Of the celebrated
POWELTON
Semi-Bituminous Gas and Anthracite Coals,
104 WALNUT STREET, PHILADELPHIA.
BRANCH OFFICES:
New-York, Trinity Building; 17 Doane-street, Boston; Cleveland, O; Pittsburgh, Pa. Jan. 30-6m-is.

SAMUEL BONNELL, JR.,
Offers for Sale his
SUGAR CREEK
AND
HONEY BROOK
LEHIGH COALS,
OFFICE—13 AND 45 "TRINITY BUILDING,"
111 BROADWAY, N. Y.

E. B. ELY & CO.,
SHIPPERS OF
COAL,
33 Trinity Building, 111 Broadway,
NEW-YORK.
"Old Company's" Lehigh, J. H. Swoyer's Enterprise, Wyoming, Wilkesbarre, and Locust Mountain Bituminous Coal.
E. B. ELY. S. W. ELY.
Apr. 24-1y-q

HONEY BROOK COAL COMPANY,
Exclusive Miners and Shippers of the Celebrated
HONEY BROOK LEHIGH COAL,
No. 111 BROADWAY, NEW-YORK.
JAS. H. LYLES, Agent.
Wharves, Port Johnson, N. J. Philadelphia Office, 209 Walnut-street.
Apr. 20 1y J. B. McCREARY, President.

WILKESBARRE COAL,
Delivered Direct from the Mines of
The Wilkesbarre Coal and Iron Co.,
OR FOR RESHIPMENT AT
HOBOKEN AND JERSEY CITY.
Office, No. 80 Broadway,
April 1-1y NEW-YORK.

WHITE, FOWLER & SNOW,
Successors to JOHN WHITE & CO.,
Wilkesbarre and Lehigh Coal,
FOR STEAM AND FAMILY USE.
OFFICE,
ROOM NO. 75, 111 BROADWAY (Trinity Building).
JNO. WHITE. LINDLEY H. FOWLER. LOUIS T. SNOW.
Jan. 1-1y

DAY, HUDDELL & CO.,
MINERS AND SHIPPERS OF
HARLEIGH LEHIGH COAL,
And the Celebrated
HICKORY, BROAD MOUNTAIN, EXCELSIOR, SHAMOKIN AND NEW-ENGLAND RED-ASH.
OFFICES,
ROOM 51, TRINITY BUILDING, 111 Broadway.
Philadelphia, 109 WALNUT STREET. Boston, 7 DOANE STREET.
ap. 20-1y

RANDOLPH BROTHERS,
SOLE AGENTS OF THE ORIGINAL
SPRING MOUNTAIN LEHIGH COAL,
Extensively Used for Smelting Iron.
ROOMS, 28 AND 30, TRINITY BUILDING,
Apl. 6-tf NEW-YORK.

COXE BRO.'S & CO.,
Cross Creek Colliery,
Miners and Shippers of the Celebrated
Cross Creek Free Burning Lehigh Red Ash Coal.
FROM THE BUCK MOUNTAIN VEIN.
OFFICES:
Philadelphia, No. 341 Walnut Street. | Drifton, Jeddo P. O., Luzerne Co., Pa.
Agent in New-York, SAMUEL BONNELL, JR., Room 43, Trinity Building,
Feb.-1y 111 Broadway.
H. N. BURROUGHS, Pres't. H. T. SHILLINGFORD, Sec'y.
H. H. SHILLINGFORD, Treas.

KITTANING COAL COMPANY,
SOLE MINERS AND SHIPPERS OF
BITUMINOUS COAL,
FROM THE COLLIERIES:
Tunnel Hill (LEMON VEIN), Gallitzin Cambria Co.
Beaverton (PHŒNIX VEIN), Osceola Mills, Clearfield Co.
Unequalled for Steam, Rolling Mills, Forges, Glass Works, Brick Kilns, Lime Kilns, and Coke, for the Manufacture of Steel, etc.
OFFICE:
125 South Fourth Street (Forrest Place).
July 6-6mo

COAL SHIPPERS.

Pier No. 14 North Pt. Richmond.
C. J. & J. H. EASTWICK & CO.,
SHIPPERS OF
WHITE AND RED ASH COAL.
No. 228 DOCK STREET, PHILADELPHIA, and No. 19 DOANE STREET, BOSTON.
BURNSIDE RED ASH, SHAMOKIN WHITE ASH, LOCUST MOUNTAIN WHITE ASH COAL.
Jan.1y-is s.a.

THE DESPARD COAL COMPANY
OFFER THEIR SUPERIOR
DESPARD COAL
To Gas Light Companies throughout the country.
MINES IN HARRISON COUNTY, West Virginia.
WHARVES, LOCUST POINT, COMPANY'S OFFICE, No. 29 South St., } Baltimore.
AGENTS:
PARMELE BROTHERS, No. 32 Pine St., New-York.
BANGS & HORTON, No. 31 Doane Street, Boston.
Among the consumers of Despard Coal we name: Manhattan Gas Light Co., New-York; Metropolitan Gas Light Co., New-York; Jersey City Gas Light Co., Jersey City, N. J.; Washington Gas Light Co., Washington, D. C.; Portland Gas Light Co., Portland, Me.
☞ Reference to them is requested. May 30-1y

LEWIS AUDENRIED & CO.,
Miners and Shippers of the following celebrated
ANTHRACITE COALS.
From Philadelphia and the Mines.
DIAMOND, Red Ash; SPOHN, Red Ash; ORCHARD, Pink Ash; BROAD MOUNTAIN, White Ash; LOCUST MOUNTAIN, White Ash; BLACK HEATH, White Ash OLD COMPANY'S LEHIGH; WILKESBARRE.
From Port Johnston and Jersey City,
OLD CO.'S LEHIGH, HAZLETON, WILKESBARRE, AND SHENANDOAH COALS.
Also the superior CUMBERLAND COALS,
BROAD TOP, SEMI-BITUMINOUS, at Philadelphia. BARTON, GEORGES CREEK, at Baltimore. BARTON, GEORGES CREEK, at Alexandria.
205 Walnut Street, PHILADELPHIA; 14 Kilby Street, BOSTON; 34 Westminster Street, PROVIDENCE; 24 Second Street, BALTIMORE.
110 BROADWAY, NEW-YORK.
July 13-1y

English Coal and Cannel.
DESPARD COAL, from Baltimore,
PROVINCIAL COAL,
SCHUYLKILL ANTHRACITE COAL,
For sale in lots to suit
PARMELE BROS.,
Agency of OSCAR I. VAN WART, Liverpool.
OFFICE, No. 32 PINE STREET, NEW-YORK.
Yard, West 22d Street, near 10th Avenue.
Feb.27-1y

W. D. CRANE & CO.,
SHIPPERS OF
Anthracite and Bituminous
COAL,
For Iron and Steam Purposes.
NEW-YORK: 115 Broadway. | BOSTON: 26 Kilby Street.
Apr.10-tf

VAN WICKLE & STOUT,
Miners and Shippers of
FULTON & STOUT
LEHIGH COALS.
Office, 119 Broadway, Room 18, New-York.
Our Fulton Lump is a Superior Article for FOUNDRY USE. Feb.20-1y

MORRIS & BRAMAN,
SHIPPERS OF
Lehigh, Wilkesbarre, Hazleton, Chauncey, Red Ash, and Bituminous
COAL.
Office, 47 Trinity Building, 111 Broadway, New-York.
E. L. MORRIS. J. A. BRAMAN.
Apr.24-tf-q

G. B. LINDERMAN & CO.,
MINERS,
Sugar Loaf, Lehigh Coal.
OFFICE:
50 TRINITY BUILDING,
May 23-1y 111 BROADWAY, N. Y.

TYLER & CO.,
SOLE AGENTS FOR THE SALE OF
J. J. Conner's "Girardville" and "McMichael" Locust Mountain and "Duncan" Red Ash Coals.
Also, dealers in the best varieties of Lehigh, Shamokin and Wilkesbarre
COALS.
16 TRINITY BUILDING, New-York.
19 DOANE STREET, Boston.
228 WALNUT STREET, Philadelphia.
HATCH & TYLER, Hartford, Conn.
May 1-1y Box 1371, P. O., N. Y.

ENGINEERS.

P. H. VAN DER WEYDE, M.D.,
Professor of Chemistry and Metallurgy,
N. Y. DENTAL COLLEGE,
(Late Professor of the N. Y. Medical College, of Mechanics, etc., at the Cooper Institute, and of Industrial Science at the Girard College, Philadelphia.)
Analytical and Consulting Chemist and Engineer.
RESIDENCE—73 Seventh Street.
LABORATORY—Twenty-third Street, cor. of Sixth Avenue.
OFFICE—37 Park Row, New-York City.
Jan. 30-tf-

LABORATORY
OF THE
ATLANTIC QUARTZ CO.,
3045 and 3047 Chestnut St., Philadelphia,
Under the Direction of
CHARLES P. WILLIAMS,
Late Professor of Analytical and Applied Chemistry, Polytechnic College of the State of Pennsylvania, for the Analysis, Assay and Valuation of Ores, Minerals, Fertilizers and Commercial Products, and for instruction in Analytical, Experimental and Technical Chemistry.
☞ Special attention given to Fertilizers.
Feb. 20-1y-is

R. P. ROTHWELL,
Mining and Civil Engineer and
METALLURGIST,
From the Imperial School of Mines, Paris, Member of the Geological Society of France, etc.
OFFICE, WILKESBARRE, PA.
Having had a large practical experience in Europe and this country, is prepared to examine and report on all kinds of Mineral property, superintend Mines and Metallurgical Works, Assay Ores, etc. 18-2-qp

BENJAMIN SMITH LYMAN,
Mining Engineer, Geologist and Topographer,
No. 135 South Fifth Street, Philadelphia.

T. B. BROOKS, C. E.,
Expert in Iron Ores, Mines,
And Blast Furnaces,
(ASSISTANT ON GEOLOGICAL SURVEY OF MICHIGAN,)
May 7-3m Negaunee, Marquette Co., L. S., Mich.

Adolphus [illegible], Chemical Engineer,
May be employed professionally as an expert on practical subjects, involving both Chemical and Mechanical knowledge. A specialist in various branches of Technology. Assays and Analyses of all kinds. Address, Editorial Rooms of the "Engineering and Mining Journal," 37 Park Row, New-York City.
☞ Written communications preferred. Nov. 28-tf.

GEO. W. MAYNARD,
PROFESSOR OF MINING AND METALLURGY,
Rensselaer Polytechnic Institute, Troy, N. Y.,
is open to engagement for the summer months for the examination of Mining Property, or for any work bearing upon Mining or Metallurgy. June 12-tf

INSTRUCTION.

Practical Geology and Mining.
Young men desiring to qualify themselves for Geological Exploration or the Management of Mining Operations, may be admitted as Partial Students in McGILL COLLEGE, Montreal, and will have the benefit of the courses of Geology, Mineralogy, Chemistry, Physics, Mathematics, as well as courses in Metallurgy and Mining. The classes will commence on MONDAY, SEPTEMBER 20.
For information as to details, apply to the Principal of the University, or to the undersigned.
W. C. BAYNES, B.A.,
July 20-2t SECRETARY.

School of Mines, Columbia College.
FACULTY.—F. A. P. BARNARD, S.T.D., LL.D., PRESIDENT; T. EGLESTON, JR., E. M., Mineralogy and Metallurgy; F. L. VINTON, E. M., Mining Engineering; C. F. CHANDLER, PH. D., Analytical and Applied Chemistry; JOHN TORREY, M.D., LL.D., Botany; C. A. JOY, PH. D., General Chemistry; W. G. PECK, LL.D., Mechanics; J. H. VAN AMRINGE, A.M., Mathematics; O. N. ROOD, A.M., Physics; J. S. NEWBERRY, M.D., LL.D., Geology and Paleontology. Regular courses for Mining Engineering; Metallurgy; Geology and Natural History; Analytical and Applied Chemistry. Special students received for any of the branches taught. Particular attention paid to assaying. For further information and catalogues, apply to
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Nov. 21-1y-is

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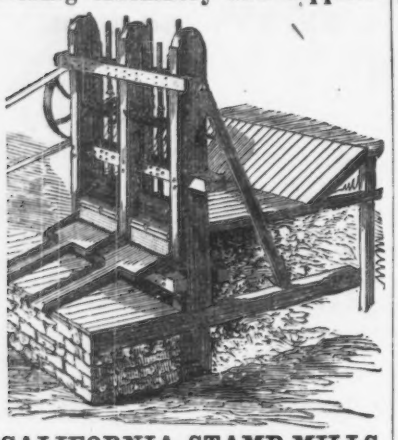

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With Self-Discharging Quicksilver Apparatus.
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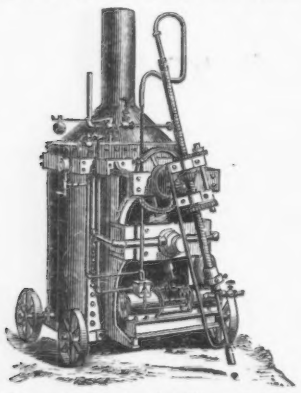

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Concentration by means of Air

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The **Mechanical Combinations** are extremely simple, the machines therefore correspondingly durable. A continuous self-delivery of ore on one side and tailings on the other is effected, hence very little attention is required except keeping the hopper supplied with ore. The power of one man is sufficient to operate a machine that will concentrate one ton per hour.

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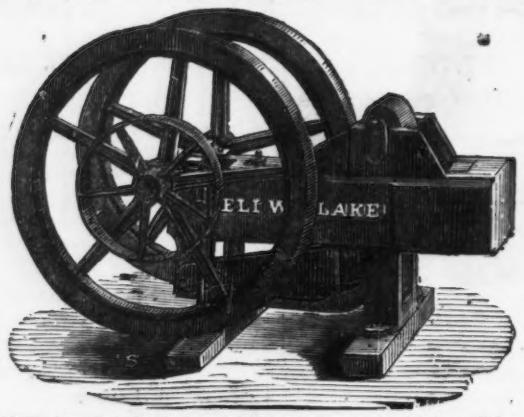

The office of this Machine is to break Ores and Minerals of every kind into small fragments, preparatory to their further comminution by other machinery.
This machine has now been in use, enduring the severest tests, for the last ten years, during which time it has been introduced into almost every country on the globe, and is everywhere received with great and increasing favor as a labor-saving machine of the first order.
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☞ The Patents obtained for this machine in the United States and in England having been fully sustained by the courts, after well-contested suits in both countries, all persons are hereby cautioned not to violate them; and they are informed that every machine now in use or offered for sale, not made by us, in which the ores are crushed between upright convergent faces or jaws actuated by a revolving shaft and fly wheel, are made and used in violation of our patent.
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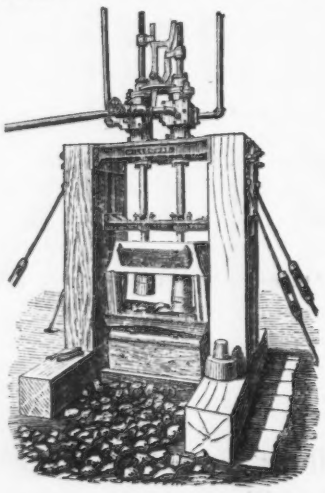

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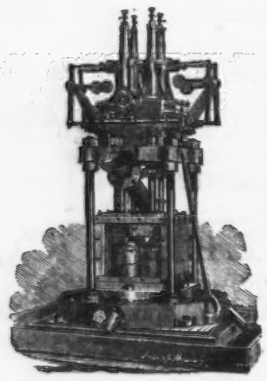

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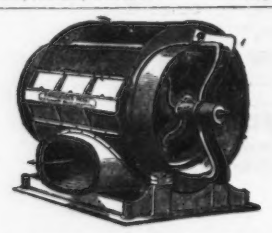

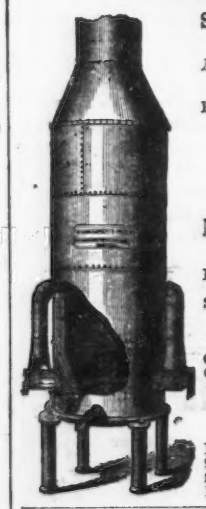

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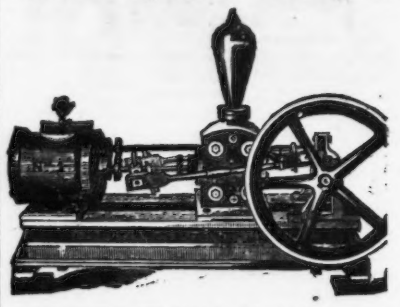

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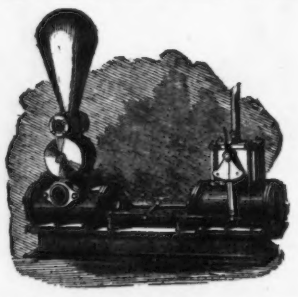

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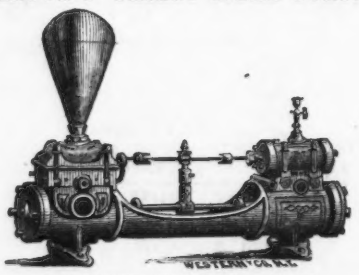

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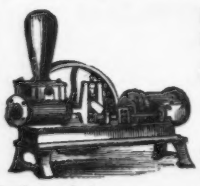

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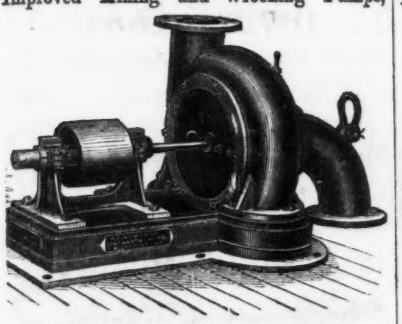

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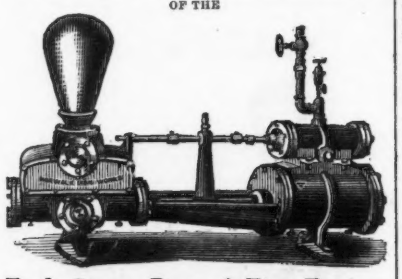

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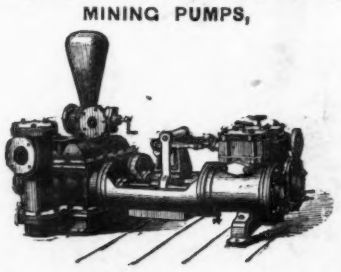

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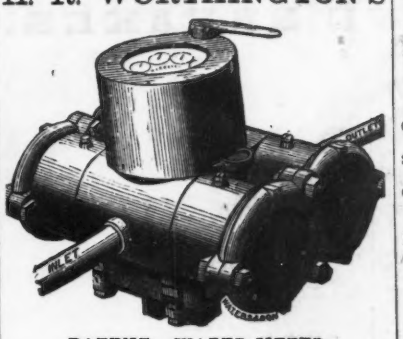

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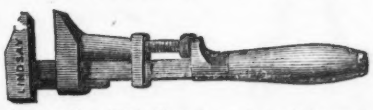

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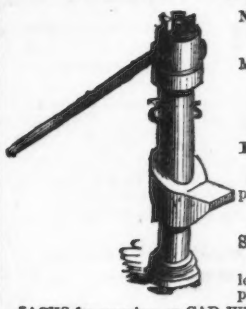

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ALL COMPACT, LIGHT, AND DURABLE.

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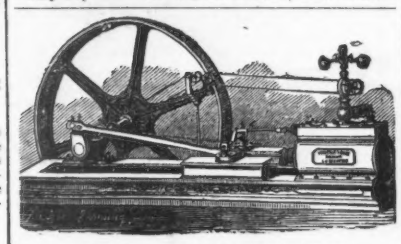

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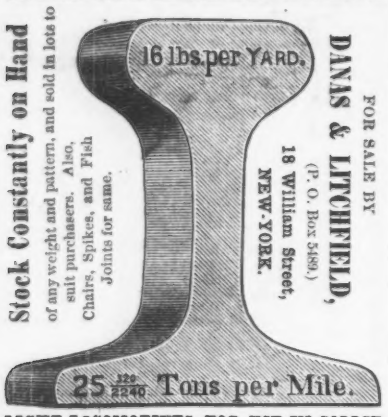

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